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Self-Unloading Boats

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SELF-UNLOADING BOATS, or in other words boats equipped to unload their cargoes without the help of dock equipment, have of late years to come to play a large part in the transportation of certain bulk materials, particularly crushed stone, sand and gravel, coal and cement. Most of the development in this type of water transport has taken place on the Great Lakes, where during the period from 1915 to 1929 boat shipments of crushed stone increased five and one-third times or from 3,000,000 tons per year to 16,000,000 tons per year.

During the same period the shipments of iron ore rose from 51,000,000 tons annually to 73,000,000 tons, an increase of 43%, and coal went from 26,000,000 to 39,000,000 tons per year, an increase of 50%, while grain shipments remained about stationary.

This considerable increase in the amount of stone shipped by boat is no doubt largely the result of the stimulus given to such water transportation by the development of the self-unloading type of boat. Practically all of this stone tonnage has been handled in such boats and at a total handling charge of around 1/10 of 1 cent a ton mile. A further result of this development in the economical handling of such bulk cargoes has, of course, been that suitable deposits of stone located on water but heretofore inaccessible so far as rail shipments were concerned, have been developed into large operations.

Practically all of this stone tonnage originated at Rogers, Alpena and Rockport, Mich., and Sturgeon Bay, Wis., with additional production now coming in from the new Inland Lime and Stone Co. plant near Manistique, Mich. The haul from the Rogers plant is about 380 mi. to the Chicago district, 265 mi. to Detroit, 370 mi. to Cleveland and 520 mi. to Buffalo; while the haul from Alpena or Rockport to Chicago is about 485 mi., to Cleveland 265 mi. and to Buffalo 415 mi. Sturgeon Bay and Manistique have, of course, an advantage in being closer to the Chicago district, while Alpena has a similar advantage as to Lake Erie points.

Advantages of Self Unloaders

The principal advantage of the self-unloading boat is that it is independent of any shore unloading equipment and can unload at any point without delay. Although the shore equipment at the larger docks would permit of rapid unloading, the smaller ones do not have such equipment and are not justified in having it, so that on the whole the vessel with its own unloading equipment has a distinct advantage in that it is not tied up or delayed because of inadequate shore equipment. Since a boat with its own unloading equipment can discharge its cargo on a dock anywhere in much less time than ordinarily required by the other method, and without the necessity of awaiting its turn at the shore equipment,

Typical view of self-unloading boat discharging cargo at dock

the advantage of such a self-unloading method is readily seen. With the boat equipment, unloading of the cargo is accomplished in many cases in only one-third to one-fourth the time required by shore equipment, so that there is a saving of as much as 25% in cargo handling time, depending upon the length of the haul.

In actual practice it has been shown that the additional cost of operating the boat's unloading equipment is not such an important item, since the time saved by its use has made it possible to carry and unload cargoes at less cost in that way than when depending upon shore equipment.

Methods of Unloading

This unloading of stone, sand and coal cargoes from such boats is accomplished in several different ways: (1) with belt conveyors below the cargo space, discharging the material to an inclined conveyor, and from that to another belt conveyor mounted on a frame or boom which is swung out over the dock; (2) with drag scrapers in tunnels below the cargo and discharging to an inclined conveyor and boom belt conveyor as in the first case; (3) with drag scrapers working over the top of the load and also discharging to a boom belt conveyor as in the first and second cases; (4) with a clamshell bucket and derrick rig swinging out over the dock, or emptying on to a boom belt conveyor; (5) and (in the case of sand only) with suction pumps and pipe lines.

Bulk cement cargoes are unloaded in several ways: (1) by means of screw conveyors below the cargo, discharging to Fuller-Kinyon pumps, which force the material ashore through pipes; (2) by screw conveyors below the cargo, discharging to a bucket elevator and then to a screw conveyor which carries it ashore; (3) by drag scrapers in tunnels below the cargo, discharging to Fuller-Kinyon pumps as above; (4) by drag scrapers working over the top of the cargo and feeding Fuller-Kinyon pumps.

A Large Fleet of Lake Unloaders

Upwards of 70 boats with a total cargo carrying capacity of more than 280,000 tons are equipped in one way or another for the unloading of these materials without the help of dock equipment.

Bulk cement is carried in 19 such self-unloading boats with a total cargo capacity of about 35,000 tons; sand is unloaded by pumping through pipe lines by several boats mentioned later; and sand and coal are unloaded by means of clamshell and derrick equipment on 20 odd boats having a total cargo capacity of around 35,000 tons.

The bulk of the stone, coal and sand transported on the Great Lakes is handled in some 31 of the largest vessels, which are all equipped with unloading conveyors. Fifteen of these, with a total carrying capacity of about 130,000 tons, are equipped with belt conveyors below the cargo space, while 16, with a total carrying capacity of about 80,000 tons, are equipped with drag scrapers for collecting the material from the cargo hold. Of these 16, 14 have scrapers operating in tunnels at the bottom of the hold, and two have scrapers operating over the top of the cargo. All of them make use of a boom belt conveyor for piling the material on to the dock.

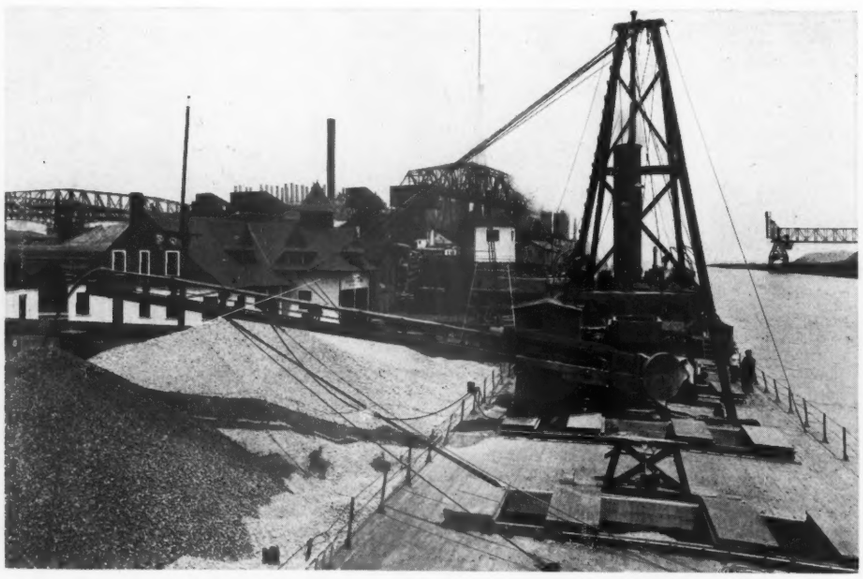
The steamship "Hennepin," first belt conveyor type self-unloading boat

Belt Conveyor System

In the case of the first type mentioned, that with belt conveyors in the hold, the cargo space is arranged with sloping hopper bottoms above the conveyors so that the material may be fed on to them from the hopper openings. Two parallel conveyors running lengthwise in the bottom of the hold are used in all of these boats with the exception of one, which is arranged with four parallel conveyors. In each case the conveyors carry the material forward and up a slight slope in order to discharge it to an inclined conveyor (either a belt conveyor or a pan conveyor type elevator) which passes up through the deck just forward of the cargo space. This elevator or conveyor, as the case may be, discharges to a belt conveyor mounted on a frame or boom which is pivoted at the discharge point of the inclined conveyor and may be swung around over the dock at right angles to the boat on either side. It is also arranged so that it may be raised to any angle up to 20 or 22 deg., thus permitting the piling of the material on to the dock up to a height of 50 ft. or more. The conveyor units and the boom are operated by steam engines on most of the boats, although several are electric motor driven.

During the unloading operation, the material is fed from the hoppers on to the belts by means of rack and pinion operated slide gates with spouts. On a number of the boats these are power operated by means of a reciprocating rod driven from one end, and so arranged that any gate along the conveyor may be opened or closed by throwing in a dog and allowing it to operate a pawl and ratchet on the end of the pinion shaft of the gate.

The belt conveyors in the hold are mostly 42- and 48-in. wide, with boom conveyors up to 54-in. wide and 160 ft. long. Such equipment permits the unloading of these boats in from 4 to 6 hr. when carrying stone, or at



Another view of the "Hennepin" discharging cargo of crushed stone

a rate of about 2000 tons per hour. When carrying coal the unloading rate is only about one-half as great because of the greater bulk of the same weight of the coal.

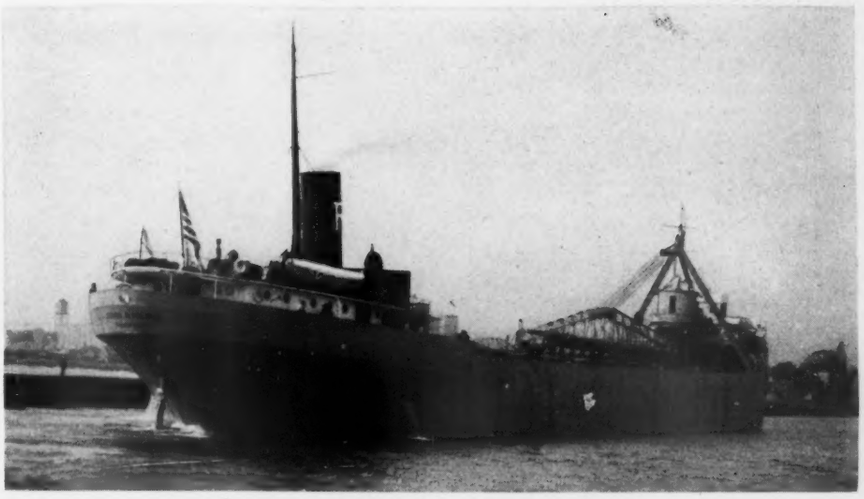
Tunnel Scraper System

This is a system of unloading which was devised and patented in 1923 by Leatham D. Smith of the Leatham D. Smith Dock Co., Sturgeon Bay, Wis. It is particularly applicable to the conversion of vessels not of the self-unloading type which have been seriously affected by the competition of the modern 600-ft. freighter, and can be installed at less cost than the belt conveyor system.

It consists essentially in using drag scrapers in tunnels at the bottom of the cargo hold, instead of belt conveyors, to carry the material to an inclined conveyor and boom belt conveyor such as just described.

The usual arrangement is to build into the hold two longitudinal tunnels whose sloping roofs form the hopper bottoms of the cargo space. The tunnels have hinged doors along each side so that the flow of material into them from the cargo space may be regulated, and the doors and hopper bottoms are also arranged so that the cargo space is self-cleaning.

In each tunnel a drag scraper is used to scrape the material to one end of the boat, where it travels up to a short incline and discharges its load into a hopper. From this hopper the material is fed on to an inclined conveyor, which in turn discharges to a boom belt conveyor as in the case of the other system. A small auxiliary tunnel between the two main tunnels is used to house the back haul cables of the scrapers. In each main tunnel the back haul cable is reeved through a trolley which runs on an I-beam at the top of the tunnel, this arrangement keeping the scraper above the material during the back haul operation.



Self-unloading steamer "John A. Kling" of the Rockport Steamship Co.

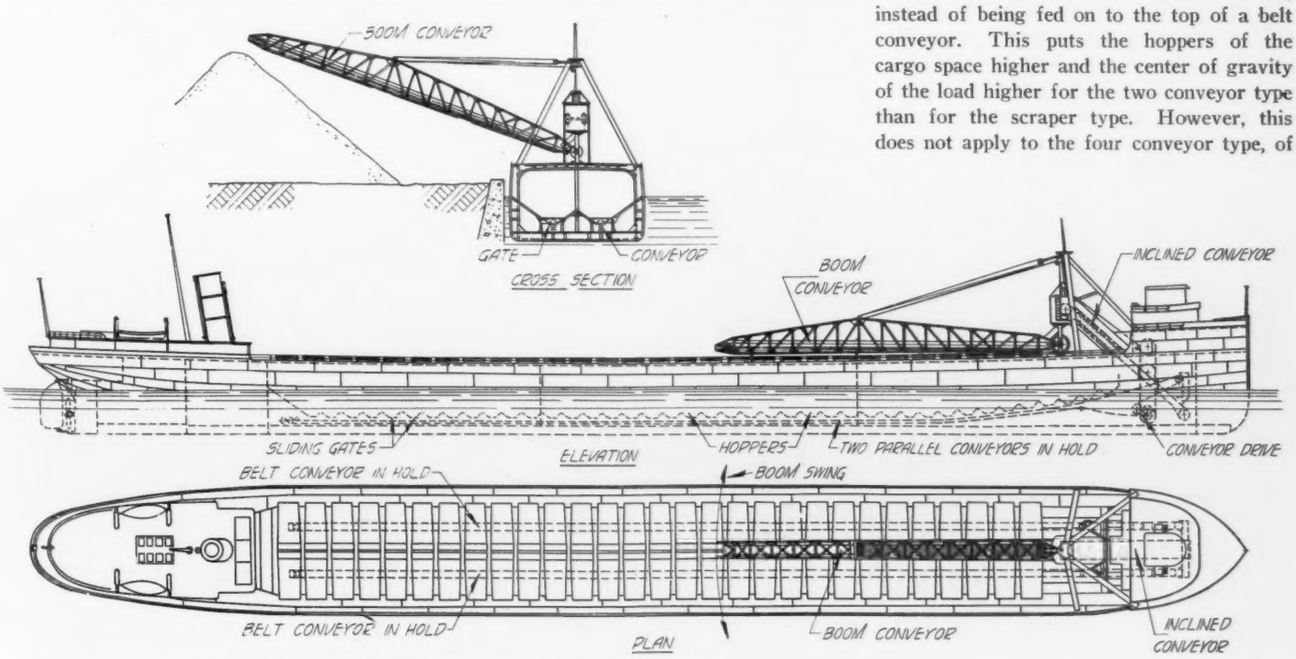
A double-drum hoist which is located as a rule near the hopper is used for operating the scraper. The scrapers range in size from 4- to 10-yd. and are operated at loaded speeds of about 250 ft. per min. and back haul speeds of 500 ft. per min. Belt conveyors up to 60 in. wide and with belt speeds up to 375 ft. per min. are used. In most of these installations the scrapers and conveyors are driven by steam engines, although recent installations have electric motor drives in connection with Diesel engine power. This system has been installed in boats up to 9500 tons capacity, and unloading speeds up to about 1200 tons per hour on stone have been obtained.

Comparison of the Two Systems

In attempting any comparison of these two principal self-unloading systems for handling coarse bulk materials, that is, of the all-belt conveyor system as against the combination of drag scrapers and belt conveyors, various features of each must be considered, such as vessel stability, first cost, operating cost, repairs and maintenance, unloading time, breakage of material, etc.

Considering these various points, stability is of course of primary importance and the condition of stability must be met in any case, to insure safety. With either system the center of gravity of the load is raised and the stability lessened, over what it would be without the unloading equipment, but not necessarily to a point where the boat is unseaworthy.

With the tunnel scraper system the cargo is kept lower in many of the installations because the tunnels may be low and because the material is fed into them from the sides, instead of being fed on to the top of a belt conveyor. This puts the hoppers of the cargo space higher and the center of gravity of the load higher for the two conveyor type than for the scraper type. However, this does not apply to the four conveyor type, of



Typical arrangement of self-unloading boat with belt conveyors below cargo space

Looking down on the hopper bottom of a belt conveyor type boat

which there is one example on the Great Lakes. For the scraper type boat the loss of cargo space due to the tunnels is approximately 15%, this varying of course with the size and shape of the boat, whereas in the belt conveyor type boats with two conveyors this loss is as a rule somewhat greater, even running up to as much as 30% in some of the earlier boats. However, in the case of four belt conveyors it is only about 10%. In either case the stability is satisfactory, and any loss of cargo capacity is more than made up for by the lower carrying and handling cost which results from having the independent and faster self-unloading machinery.

The first cost of the tunnel scraper system is roughly 20% less than the belt conveyor system, this difference of course varying with the type and size of boat and whether or not it is converted from a plain bulk carrier or is built new. In other words, a conversion to the tunnel scraper system which might cost $200,000 to $250,000 would cost about $275,000 to $300,000 for the belt conveyor system.

Over against this, however, the operating cost, including labor, power, repairs and maintenance, is considered by many to be higher for the scraper system than for the belt conveyor system. About the same number of men are needed to operate, approximately six to eight, but more power is required to drag the scraper back and forth than to carry the material on belts, and also the maintenance and repairs on scrapers, tunnels and cables are reported in some instances higher than the upkeep of the belts.

The belt conveyor system also has the advantage of quicker unloading, which is done at rates up to 2000 tons of stone per hour (almost 3000 tons per hour on the largest belt conveyor type boat), while about 1200 tons per hour is understood to be the maximum with the scrapers.

This quicker rate of unloading means of course more trips and greater earning capacity. Also entering into the matter of unloading time is the time and effort necessary to clean up after discharging the bulk of the cargo, particularly when changing from one cargo to another (as from coal to stone or vice versa). This cleaning up is of course quite necessary in those boats carrying stone in one direction and coal in the other. While there is naturally some spill from the belt conveyors, the time required for cleaning up is said to be less than in the case of the scraper tunnels.

Another point of difference in the two systems is the matter of breakage of the material being handled. There is very little breakage where the belt conveyors are used below the cargo hoppers, but there is an appreciable amount of it, particularly in the case of coal, in the other system where the scraper is being pulled back and forth over the material in the tunnel. Thus the belt conveyor type of self-unloading boat, although somewhat higher in first cost, has some very appreciable advantages in the long run.

First Self-Unloading Boat

Although the present self-unloading steel vessel dates from 1908, when the Michigan Alkali Co. began using such boats to carry stone from Alpena to Wyandotte, Mich., the first use of this type of boat goes back to 1902.

Credit for being the pioneers in this method of unloading belongs to the Lake Shore Stone Co. and A. J. Blair, manager, Milwaukee, Wis. In that year they put into service the first boat to be equipped with belt conveyors for unloading its cargo of stone. This boat, the *Hennepin*, was operated between the quarry at Belgium, Wis., and Milwaukee, Chicago and other lake ports and was in this service more than 20 years. It was also later used by the Construction Materials Co., Chicago. It was a wooden vessel 209 ft. long by 35 ft. beam, and carried a cargo of 1000 tons of crushed stone.

Sloping hopper bottoms were built into it, dividing the hold into two pockets lengthwise so that the contents could be fed through a series of gates on to two parallel 24-in. belt conveyors underneath the hopper bottoms. A loading hopper, movable on a track, was used to feed the stone on to each belt. These conveyors carried back to a point just forward of the engine room, where they discharged to a 32-in. inclined belt conveyor which passed up through the deck. This conveyor in turn fed a 32-in. belt conveyor mounted on a boom frame which could be swung out over the dock. The conveyor equipment was furnished by the Webster Manufacturing Co. and was driven by a steam engine. With it, the entire cargo could be unloaded in 7 to 8 hours.

The *Topeka*, a slightly larger wooden ship equipped in the same manner, was put in

Typical unloading boom and belt conveyor

Reciprocating rod with ratchet and pawl for operating the hopper gates

commission by the same company in 1905, and carried stone to various lake ports until lost in a collision in 1916.

Boats with Belt Conveyors for Unloading

Following the *Hennepin* and *Topeka*, the *Wyandotte* was the first of the present type of self-unloading, self-propelled steel lake carriers. This boat was built for the Wyandotte Transportation Co., a subsidiary of the Michigan Alkali Co., and was the first of a fleet of four now operated by them. The following year, 1909, the *Alpena*, a slightly larger vessel, was completed, followed by the *Huron*, and then by the *Conneaut* in 1916, the two latter being considerably larger. The *Wyandotte* and *Alpena* were respectively 346 ft. long by 45 ft. beam and 356 ft. long by 47 ft. beam, with boom conveyors 100 and 110 ft. long and carrying capacities of 4500 and 5500 tons of stone, while the *Huron* and *Conneaut* were sister ships 416 ft. long by 56 ft. beam, with 150 ft. boom conveyors and carrying capacities of 9000 tons of stone.

In the meantime, the Bradley Transportation Co., a subsidiary of the United States Steel Corp., also began to use this type of carrier. This company's original boat, the *Calcite*, which was built in 1912, was 416 ft. long by 54 ft. beam, with a carrying capacity of 5500 tons of stone and with a 90-ft. boom belt conveyor. This vessel was followed by three more, the *W. F. White* (1915), *J. G. Munson* (originally named the *C. D. Bradley* in 1917 and later changed) and the *B. H. Taylor* (1923). These three were all of the same size, 530 ft. long by 60 ft. beam, with 150-ft. boom conveyors and carrying capacities of 10,000 tons of stone.

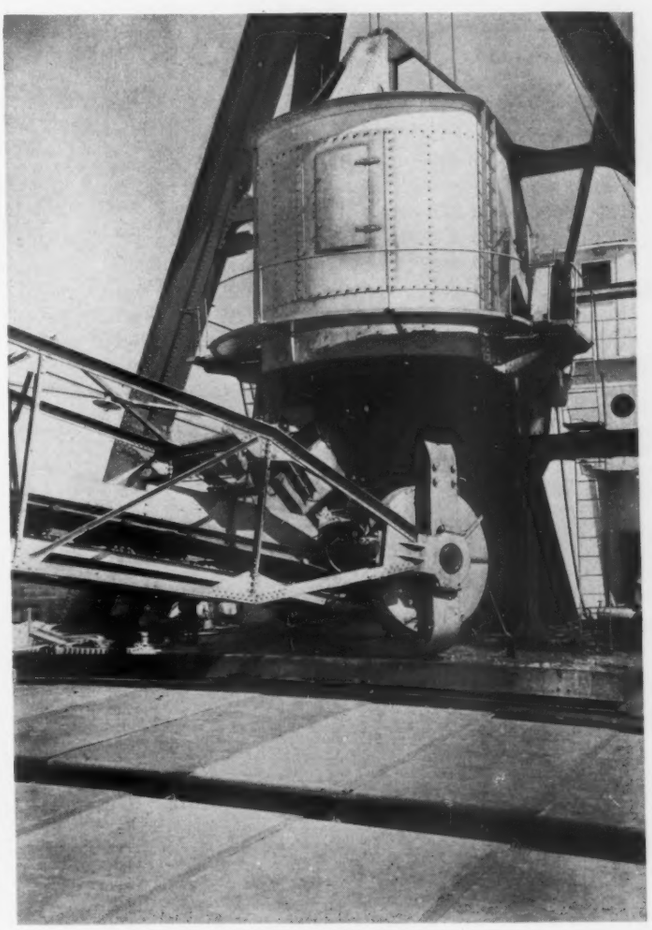
In 1925 the *T. W. Robinson* was constructed, 566 ft. long by 60-ft. beam, with a 155-ft. boom conveyor, and a carrying capacity of 11,000 tons, and in 1927 the *C. D. Bradley*, which was at that time the latest and last word in this type of boat, was put into service. The *Bradley*, 615 ft. long by 65 ft. wide, with a 160-ft. boom conveyor and a carrying capacity of 14,000 tons, is one of the largest vessels on the Great Lakes and the one of its particular type having the most mordern equipment, both electrical and otherwise. Stokers, water-tube boilers and turbo-generators are used in producing the electrical power which is used for both propulsion and for driving the unloading equipment. With the exception of the *Robinson*, which is also electrically propelled, the earlier boats are all steam engine driven with electric motors to drive part of the unloading equipment. The *Munson*, for instance, has slip ring motors with drum controllers to drive the belt conveyors, a motor to raise the boom and a steam hoist to swing the boom.

Other self-propelled boats of this type are the *J. A. Kling* and *C. C. West*, built by the Manitowoc Shipbuilding Co. in 1922 and 1925 for the Rockport Steamship Co., Sheboygan, Wis. They are respectively 430 ft. long by 56 ft. beam and 450 ft. long by 60 ft. beam, with 150 ft. and 155 ft. boom conveyors, and with carrying capacities of about 7500 tons and 8500 tons of stone.

The 12 self-propelled, self-unloading vessels mentioned above, with an aggregate cargo carrying capacity of more than 100,000 tons of stone or 70,000 tons of coal, all have the same general arrangement of conveyors. Belt conveyors 42 in. and 48 in. wide are used on the smaller boats, while on the larger boats the belt conveyors in the hold are 48 in. wide and the conveyor on the swinging boom is 54 in. wide. Pan conveyor type elevators up to 96 in. in width or inclined belt conveyors are used to carry the material from the two belt conveyors in the hold up to the boom conveyor. The slide gates on the bottom of the hoppers are spaced about 9 ft. apart, and are power operated as noted in the description of this system.

Most of these boats were equipped by the Robins Conveying Belt Co., although the Stephens-Adamson Manufacturing Co., Webster Manufacturing Co. and Link Belt Co. also have equipped several.

In addition to the 12 boats just mentioned, the Pringle Barge Line Co., Cleve-



Showing one method of pivoting the boom conveyor at the loading end

land, Ohio, has two tow barges, the *Constitution* and the *Maida,* with capacities of about 8000 and 7500 tons of stone and which are equipped with self-unloading belt conveyor systems. The *Constitution* is equipped with two belt conveyors in the hold and a 130-ft. boom conveyor, in the same general way as those boats already mentioned, but has a different hopper arrangement with two traveling bucket elevator loaders (similar to those used for loading trucks from storage piles) for cleaning up at each conveyor.

Boat with Four Belt Conveyors

The other boat, the *Maida,* is the only one thus far equipped with four belt conveyors in the hold, and is well worth a more complete description, as it has a number of interesting features.

It was converted in 1929 at the docks of the Interlake Engineering Co., Cleveland, Ohio, and is being used to carry coal from Toledo to the Detroit district. H. N. Herriman, naval architect, Cleveland, Ohio, designed and supervised the remodeling, and the conveying equipment was furnished by Stephens-Adamson Manufacturing Co.

The reason for converting it was because it was believed that the installation of such self-unloading equipment would result in more profitable operation because of the quicker unloading time. This belief was completely justified by the results obtained in the way of increased earning capacity.

This barge, which is 376 ft. long by 46 ft. beam by 26 ft. molded depth, was able to carry a cargo of 6000 tons of coal before reconstruction, and now after being converted carries a cargo of 5600 tons, so that the loss in cargo capacity is less than 7%. However, as part of the reconstruction, the first four hatches were raised 4 ft. to help compensate for some of the loss of cargo space. This accounts in part for the small loss in carrying capacity, but even without this compensating factor the loss in cargo capacity would have been only 10%, which is much less than when two conveyors only are used, and is less than in the case of the tunnel system. So that this method of construction, using four belt conveyors in the hold instead of two, seems decidedly superior from the standpoint of cargo space saved and low center of gravity of the load. The bottom of the cargo space is made up of 144 self-cleaning hoppers, 36 over each belt conveyor. At each hopper outlet a slide gate operated by a rack and pinion is used to control the flow of material to the belt. The 36 gates over each conveyor are individually opened and closed by means of a dog and ratchet arrangement power operated from a reciprocating pipe extending the length of the hold. The cargo hold itself is divided by reinforcing partitions into three compartments.

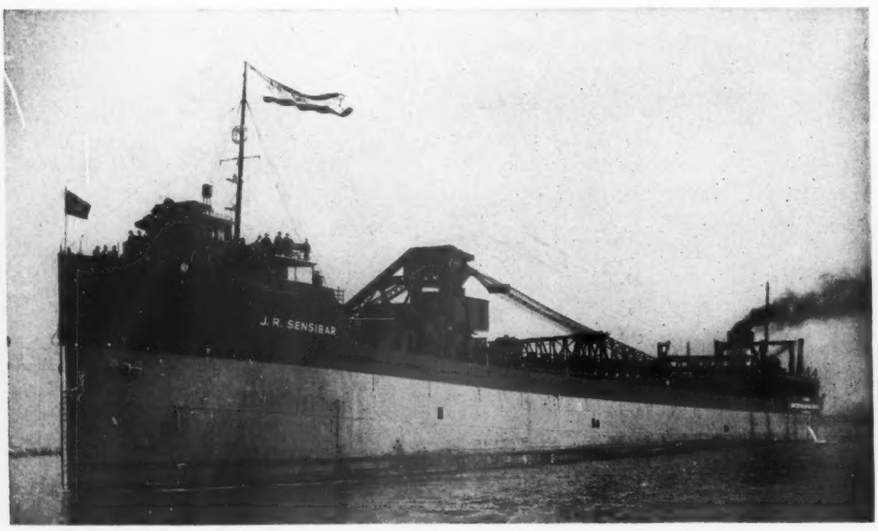
Barge "Maida" with four belt conveyors below the cargo space

The four parallel belt conveyors in the hold are each 42 in. wide by 300 ft. long and are spaced on 10-ft. centers. They carry the material to the forward end of the boat and discharge it on to two short cross conveyors discharging at the centerline of the boat. These short cross conveyors, which are 48 in. wide by 10 ft. long, feed a 54 in. by 106 ft. inclined belt conveyor extending up through the deck at an angle of about 21 deg. and discharging in turn to a 54-in. by 145-ft. belt conveyor on the swinging unloading boom. The boom conveyor may also be raised to an angle of 21 deg.

The unloading speed of this arrangement is 1000 tons of coal or 2000 tons of stone per hour. Each separate conveying unit is driven by an individual General Electric motor operating through a Falk enclosed gear reducer. Four 50-hp. motors are used on the four belts in the hold, two 10-hp. motors on the short cross conveyors, a 75-hp. motor on the inclined conveyor and a 100-hp. motor on the boom conveyor.

Power for the operation of the unloading machinery is furnished by a 435-hp. Busch-Sulzer Diesel engine, direct-connected to a 300-kw. General Electric 3-ph., 60-cyc., 480-v. generator. The electrical installation is strictly modern, with all wires in conduit, and with the motor controls interconnected electrically so that the units must be started in correct sequence, and so that in case of the failure or stopping of any unit those units back of it and feeding to it are also automatically stopped. In starting up, the boom conveyor is started first, then the inclined conveyor, then the cross conveyors, and last the conveyors under the cargo hold. About 300 hp. is required to operate the unloading equipment at full capacity.

The use of Diesel engine power and individual motor drives with enclosed gear reducers makes this one of the most economical and efficient self-unloading vessels yet constructed. As a result of the high fuel efficiency of the Diesel engine it is understood that a cargo can be unloaded at a cost for fuel of not over $10. Six to eight men are required on the unloading equipment, and the total crew is considerably less than



Belt conveyor type boat with two large suction dredge pumps

would be necessary for a steam propelled vessel of the same carrying capacity. For service such as this boat is engaged in, on comparatively short hauls and in moderately protected waters, the system of using tow barges and tugs would seem also to have some decided advantages.

Latest Belt Conveyor Type Boat

The most recent addition to the belt conveyor type boats is the *J. R. Sensibar,* which was converted during 1930 and put into service by the Construction Materials Corp., Chicago. A brief description was published in Rock Products, November 22, 1930.

It is similar to others previously mentioned in that it has two longitudinal belt conveyors in the hold, with an inclined belt and a boom belt conveyor for unloading to the dock, but in addition has other features of interest.

The vessel is 556 ft. long with a cargo carrying capacity of approximately 10,000 tons, which can be unloaded within five hours.

In addition to loading such cargoes as stone, coal and gravel through the hatches in the usual way and unloading them by belt conveyor, the vessel is equipped with two 30-in. centrifugal pumps by means of which a cargo of sand and gravel may be dredged from the lake. The arrangements are also such that this cargo may be unloaded in the same way by pumping ashore through pipe lines.

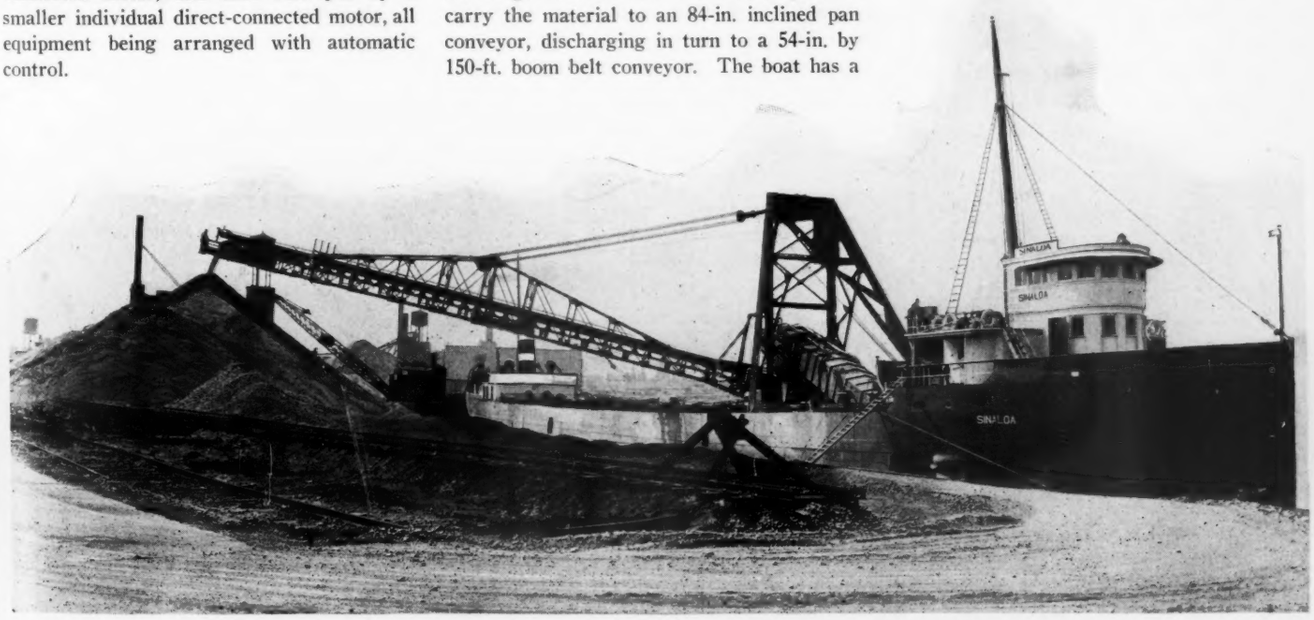
The other feature of special interest is the use of pulverized coal as fuel in the boilers in connection with most modern superheating and condensing equipment. A 3000-kw., 2300-volt General Electric turbo-generator furnishes power for both propelling and unloading. The propellor shaft is driven by a direct-connected 3000-hp. General Electric motor, each pump by a 750-hp. direct-connected motor, and each conveyor by a smaller individual direct-connected motor, all equipment being arranged with automatic control.

A drag scraper type boat unloading at dock

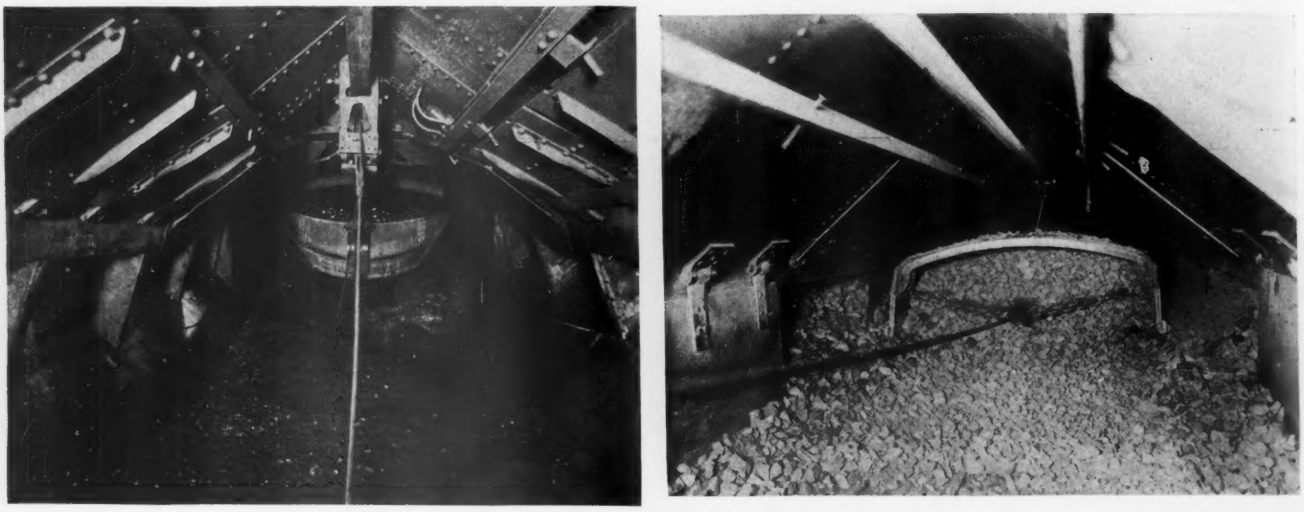
PARTIAL LIST OF THE LARGER BELT CONVEYOR TYPE BOATS HANDLING CRUSHED STONE AND OTHER SIMILAR BULK MATERIALS ON THE GREAT LAKES

	Year put in service	Rated cargo capacity in tons of stone	Conveyors in hold
Wyandotte, Wyandotte Transportation Co.	1908	4,500	(2 belt conv.)
Alpena, Wyandotte Transportation Co.	1909	5,500	(2 belt conv.)
Huron, Wyandotte Transportation Co.	1913	9,000	(2 belt conv.)
Conneaut, Wyandotte Transportation Co.	1916	9,000	(2 belt conv.)
Calcite, Bradley Transportation Co.	1912	5,500	(2 belt conv.)
W. F. White, Bradley Transportation Co.	1915	10,000	(2 belt conv.)
J. G. Munson, Bradley Transportation Co.	1917	10,000	(2 belt conv.)
B. H. Taylor, Bradley Transportation Co.	1923	10,000	(2 belt conv.)
T. W. Robinson, Bradley Transportation Co.	1925	11,000	(2 belt conv.)
C. D. Bradley, Bradley Transportation Co.	1927	14,000	(2 belt conv.)
J. A. Kling, Rockport Steamship Co.	1922	7,500	(2 belt conv.)
C. C. West, Rockport Steamship Co.	1925	8,500	(2 belt conv.)
Constitution (barge), Pringle Barge Line	.....	8,000	(2 belt conv.)
Maida (barge) Pringle Barge Line	1929	7,500	(4 belt conv.)
J. R. Sensibar, Construction Materials Corp.	1930	10,000	(2 belt conv.)
Total rated cargo capacity		130,000	

Among the larger boats of this same general type might properly be mentioned the *Midland Prince,* operated by the Canada Steamship Lines, Montreal, Canada. In this boat, which was converted in 1929, two parallel 42-in. pan conveyors were used below the cargo hold in lieu of belt conveyors to carry the material to an 84-in. inclined pan conveyor, discharging in turn to a 54-in. by 150-ft. boom belt conveyor. The boat has a cargo capacity of about 6900 tons, which can be discharged at the rate of about 900 tons per hour. Individual electric motor drives are used throughout, 125-hp. for each of the three pan conveyor units, 100-hp. for the



Steamer "Sinaloa," which is equipped with two drag scrapers below the cargo space



Two views showing arrangement of tunnels and scrapers below the cargo space

boom belt conveyor and 50-hp. for the boom hoist. The conveying equipment was furnished by the Stephens-Adamson Manufacturing Co.

According to recent information this list of belt conveyor type self-unloading boats will soon be increased by at least three, it being reported that the Boland and Cornelius Steamship Co., Buffalo, N. Y., operating a large fleet of bulk carriers on the Great Lakes, will convert at least three 10,000-ton vessels to self-unloading boats. It is understood that the conveying equipment for these boats will be furnished by the Robins Conveying Belt Co.

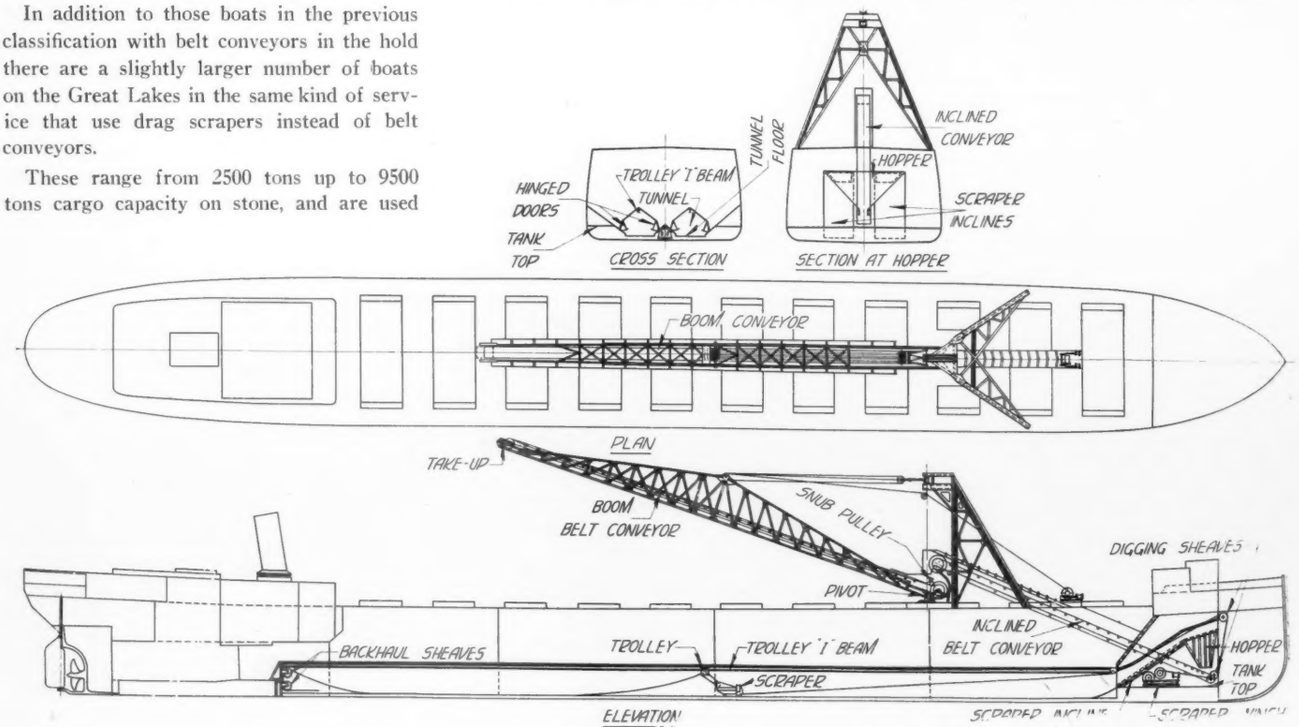
Boats with Drag Scrapers and Belt Conveyors for Unloading

In addition to those boats in the previous classification with belt conveyors in the hold there are a slightly larger number of boats on the Great Lakes in the same kind of service that use drag scrapers instead of belt conveyors.

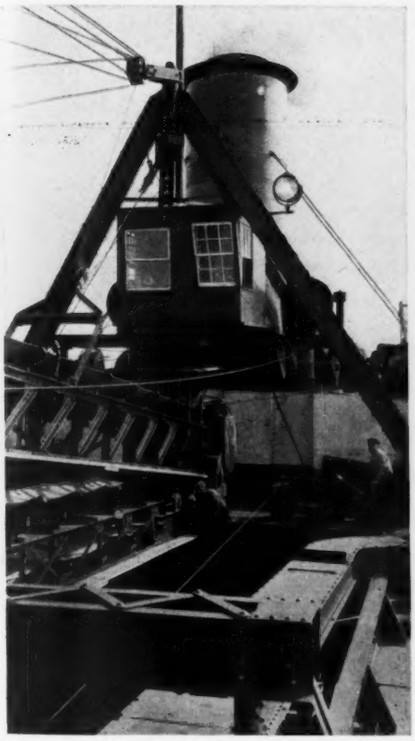
These range from 2500 tons up to 9500 tons cargo capacity on stone, and are used in handling crushed stone, sand and coal.

Quite a number of these are arranged with the Leatham D. Smith tunnel scraper system already mentioned. One group, that operated as the G. A. Tomlinson Fleet, Cleveland, Ohio, comprises the *E. M. Young, Sierra, Sinaloa* and *Sumatra,* all converted during 1928 and 1929, and with an aggregate cargo carrying capacity of about 30,000 tons of crushed stone. The *E. M. Young,* the largest of these, is 504 ft. long by 54 ft. beam by 30 ft. molded depth with a cargo capacity of 9500 tons of stone. She has been used mostly for the transporting of crushed stone from Calcite, Mich., to the Great Lakes Portland Cement Co., Buffalo. This boat is of a different arrangement from the others in that the cargo hold was divided so that the material is reclaimed near the center. Four 8-yd. Crescent scrapers were installed, one in each of the two 172-ft. parallel tunnels forward and one in each of the 126-ft. tunnels aft, all four dragging the material up inclines to one large hopper at the center. From this hopper it is fed to a 96-in. by 54-ft. S-A pan conveyor, which discharges to a 60-in. by 150-ft. boom belt conveyor. This equipment permits unloading in about eight hours.

The other three boats of this fleet, the *Sierra, Sinaloa* and *Sumatra,* are somewhat smaller and have cargo carrying capacities of approximately 7500, 6800 and 6200 tons of crushed stone respectively. Each is equipped with two 10-yd. scrapers, in two parallel longitudinal tunnels, which scrape the mate-



Typical arrangement of self-unloading boat with drag scrapers below the cargo space



Another view of the "Sandmerchant"

rial to a hopper at the forward end of the boat. From there it is fed to a 60-in. inclined belt conveyor which discharges on to a 54-in. boom belt conveyor carrying out to the dock. These boom belt conveyors are 140 ft. long in the case of the *Sierra* and *Sinaloa* and 150 ft. long on the *Sumatra*. The unloading rate is about 1000 tons per hour. One of these boats, the *Sinaloa*, was tried out during the 1929 season on the transportation of bulk cement from Buffalo to Cleveland, but this was not found very satisfactory and was discontinued.

Another group, that operated by the Valley Camp Steamship Co., Cleveland, Ohio, includes five vessels which have an aggregate cargo capacity of about 24,000 tons. The four larger of these, the *J. E. Savage, William Nelson, J. M. Kennedy* and *S. B. Way*, range from 5000 to 6000 tons capacity, the *Savage* being the largest with a length of 410 ft., and the *Way*, the smallest, with a length of 346 ft.

These were converted during the past three years and are all arranged with the Smith tunnel scraper system. Two 10-yd. scrapers are used on the *Savage* and two 8-yd. scrapers on the others, along with 60-in. inclined belt conveyors and 54-in. boom belt conveyors. The conveying equipment was furnished by Stephens-Adamson Manufacturing Co.

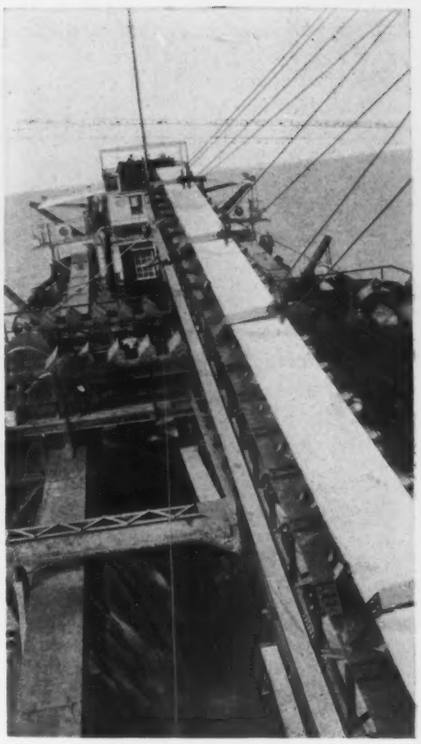
The boom conveyors are 140 ft. long on the *Savage* and *Nelson*, and 130 ft. long on the *Kennedy* and *Way*. This equipment is steam engine driven and a cargo is unloaded in about seven hours with five to six extra men. As indicating the possibilities of these boats, the *Kennedy* during one season of 220 days carried 82 cargoes of 5000 tons each, or more than 400,000 tons, covering 42,000 miles in all.

The other boat of this fleet, the *Valley Camp*, was built in England several years ago, and was one of the earlier boats equipped in this way. It has two 5-yd. scrapers, a 48-in. by 80-ft. inclined belt conveyor and a 48-in. by 85-ft. boom belt conveyor, and will unload a cargo of 2500 tons in about seven hours.

The *Fontana*, 356 ft. long by 50-ft. beam, and with a carrying capacity of about 6000 tons of stone or sand, is also of this same type, with two 8-yd. scrapers and a 150-ft. boom conveyor. In this boat the scraper tunnels were made only 28 in. wider than the scrapers with the idea of cutting down the clean-up time. It is equipped with S-A conveyors, and has been used on stone, sand and coal.

The latest addition to the vessels of this type is the *H. F. De Bardeleben*, put into service on the Gulf of Mexico late in 1930 by the Bulk Transportation Co., a subsidiary of the De Bardeleben Coal Corp.

This vessel, formerly the *Bremerton* of the U. S. Shipping Board, was converted at New Orleans and designed primarily for the handling of coal, being equipped with the Leatham D. Smith patented tunnel scraper system of unloading, using two tunnels with



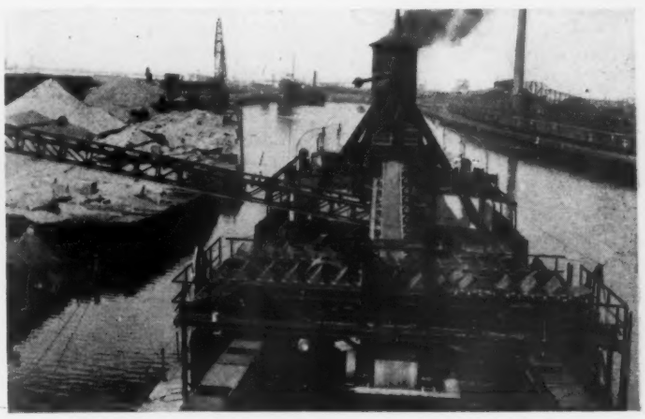
The "Sandmerchant" is loaded by suction dredge pumps, with launders and screen plates above deck

an 8-yd. scraper in each, and a 140-ft. boom belt conveyor.

The ship has a length of 380 ft. and a dead weight of 7500 tons. Three Scotch boilers with pulverized coal burning equipment and a 2000-hp. triple expansion steam engine furnish power. The cargo is automatically weighed as it is being unloaded by a "Weightometer" scale furnished by the Merrick Scale Co. and installed on the inclined belt conveyor.

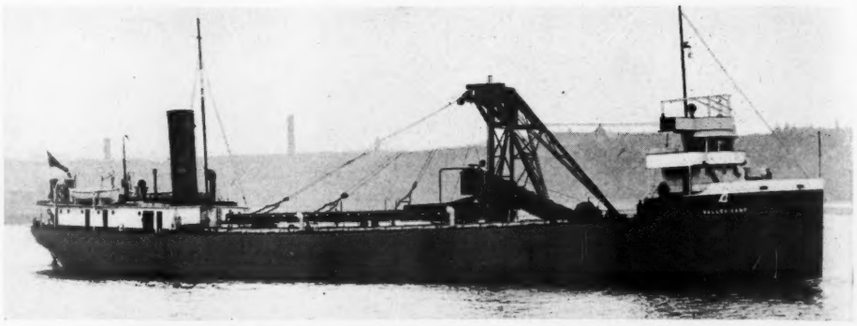
Also in this general classification might be mentioned the *Fitzgerald*, operated by D. Sullivan and Co., Chicago. This vessel is 420 ft. long by 52 ft. beam by 28 ft. total depth and has a carrying capacity of 7500 tons of sand or stone. Its unloading arrangements are, however, quite different

In the drag scraper type boats the scrapers discharge to a hopper feeding the conveyor system



The "Sandmerchant" is unloaded by scrapers above the load, emptying to a hopper which feeds two bucket elevators

from those already described. Two 4-yd. scrapers working over the top of the load, one from each end of the hold, scrape the material to a hopper at the center, from which it is fed to a 60-in. by 30-in. by 20-in. bucket elevator, which in turn feeds to a 42-in. by 110-ft. boom belt conveyor. This equipment was furnished by the Webster Manufacturing Co. It is steam operated and is able to unload a sand cargo at the rate of 800 tons per hour.



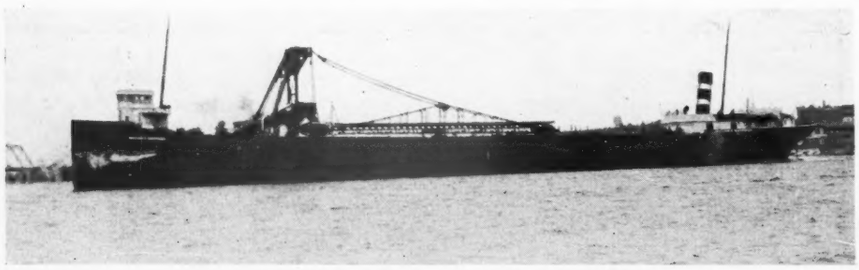
The "Valley Camp," one of the earlier drag scraper type boats

Boats with Drag Scrapers and Belt Conveyors for Unloading, and Suction Dredging Pump for Loading

Still another type, or rather a modification of the preceding type, in use on the Great Lakes, is that where a pump has been added so that the cargo may be dredged from the bottom of the lake instead of being loaded from shore through the hatches. Such boats as the *Andaste, Bay State, Aragon, Lakewood, Material Service* and *Sandmerchant* illustrate this class.

PARTIAL LIST OF THE LARGER DRAG SCRAPER TYPE BOATS HANDLING CRUSHED STONE AND OTHER SIMILAR BULK MATERIALS ON THE GREAT LAKES

	Year put in service	Rated cargo capacity in tons of stone	Scrapers used
E. M. Young, G. A. Tomlinson Fleet	1928	9,500	4- 8 yd.
Sinaloa, G. A. Tomlinson Fleet	1928	6,800	2-10 yd.
Sierra, G. A. Tomlinson Fleet	1929	7,500	2-10 yd.
Sumatra, G. A. Tomlinson Fleet	1929	6,200	2-10 yd.
J. E. Savage, Valley Camp Steamship Co.	1928	6,200	2-10 yd.
Wm. Nelson, Valley Camp Steamship Co.	1930	5,300	2- 8 yd.
J. M. Kennedy, Valley Camp Steamship Co.	.....	5,000	2- 8 yd.
S. B. Way, Valley Camp Steamship Co.	.....	5,000	2- 8 yd.
Valley Camp, Valley Camp Steamship Co.	.....	2,500	2- 6 yd.
Fontana, Maritime Steamship Co.	.....	6,000	2- 8 yd.
Fitzgerald, D. Sullivan and Co.	.....	7,500	2- 4 yd.
		67,500	



Another drag scraper type boat

The *Andaste,* the first boat to have the Smith tunnel scraper system of unloading, was changed over in 1922, and was equipped with a 20-in. Amsco pump for dredging. It was the half-whaleback type and was used in the sand trade at Lake Erie and Lake Michigan ports but was lost in a storm in the latter part of 1929.

The *Bay State,* also a whaleback, was the second boat to be converted to the Smith tunnel scraper system. This was done in 1924, and in 1926 it was further rebuilt for the sand trade and was thus used at Detroit, Cleveland and Buffalo until the end of the 1930 season when it was overhauled and sent to New York harbor for sand and gravel dredging in Long Island Sound. It is 265 ft. long by 36 ft. beam, with a cargo capacity of 2500 tons. An 18-in. Amsco pump is used for dredging, with launders and dewatering boxes on deck so that excess water is kept out of the hold. In the unloading operation the cargo is scraped through the tunnels to a hopper feeding an inclined conveyor from which it falls on to the swinging boom conveyor.

The *Aragon* has similar equipment, including an 18-in. Morris pump, and is operated in Canadian waters.

The *Lakewood,* which was described in Rock Products, August 6, 1927, was equipped with a 20-in. Morris pump, and with scraper and belt conveyor equipment, but has since been somewhat remodeled.

These boats were arranged with a single 4-yd. scraper and 40-in. belt conveyors, which were Stephens-Adamson in the case of the *Bay State* and *Aragon,* and were Link-Belt on the *Lakewood.* The cargo is loaded in from three to six hours and discharged in about the same time. In this way they are capable of handling approximately a cargo a day, or some 400,000 tons a year each.

Another boat of this type with pumps for loading, and scrapers, elevator and belt conveyor for unloading is the *Sandmerchant,* operated by the Interlake Transportation Co., Montreal, for dredging and carrying sand to Lake Erie ports. It is a vessel of 2200-yd. cargo capacity, 260 ft. long by 43 ft. beam and was converted to a self-unloader in 1928. The unloading equipment consists of two 3-yd. Crescent scrapers, one forward and one aft, working over the top of the cargo and scraping the material into hoppers amidships. From these hoppers it is fed to two 24-in. by 36-in. Webster V-bucket ele-

The "Fred W. Green" is equipped with a "thrower" on the end of the boom conveyor

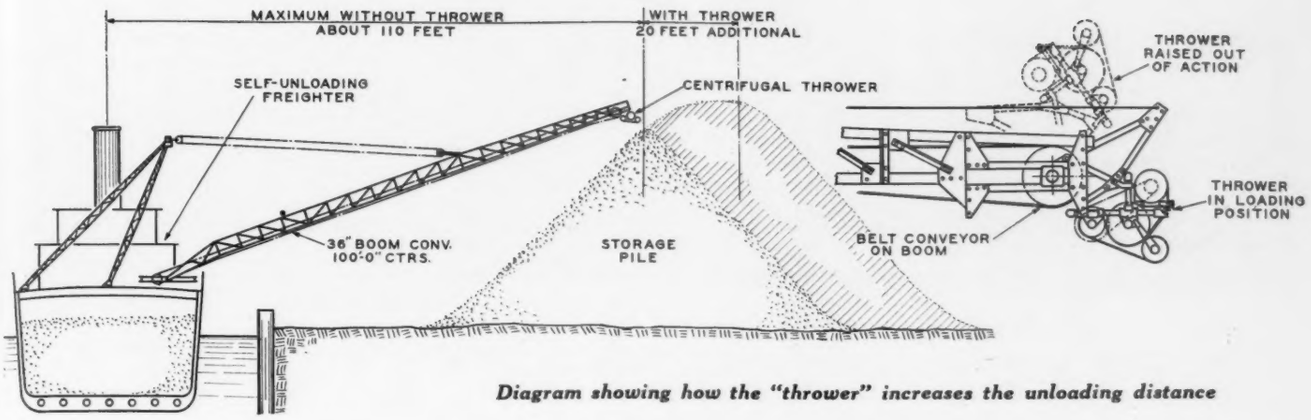


Diagram showing how the "thrower" increases the unloading distance

vators, which carry it up and discharge on to a 36-in. by 72-ft. inclined belt conveyor feeding the 36-in. by 100-ft. boom belt conveyor. Each elevator is driven by a 30-hp. motor, the inclined belt by a 20-hp. and the boom belt conveyor by a 50-hp. motor, all of which are Westinghouse direct current motors with Morse silent chain drives. Electric power is supplied by a 100-kw. General Electric 220-v. direct-current, steam-engine driven generator.

The elevating and conveying equipment was furnished by the Webster Manufacturing Co. The scrapers are operated by a Mead-Morrison double drum steam hoist, while the boom is raised or lowered by a single-drum Mead-Morrison steam hoist, and swung by a Lidgerwood two-drum electric hoist. The unloading capacity of this equipment is about 400 tons per hour. Two 18-in. suction dredge pumps are used for loading, with launders and screen plates above deck.

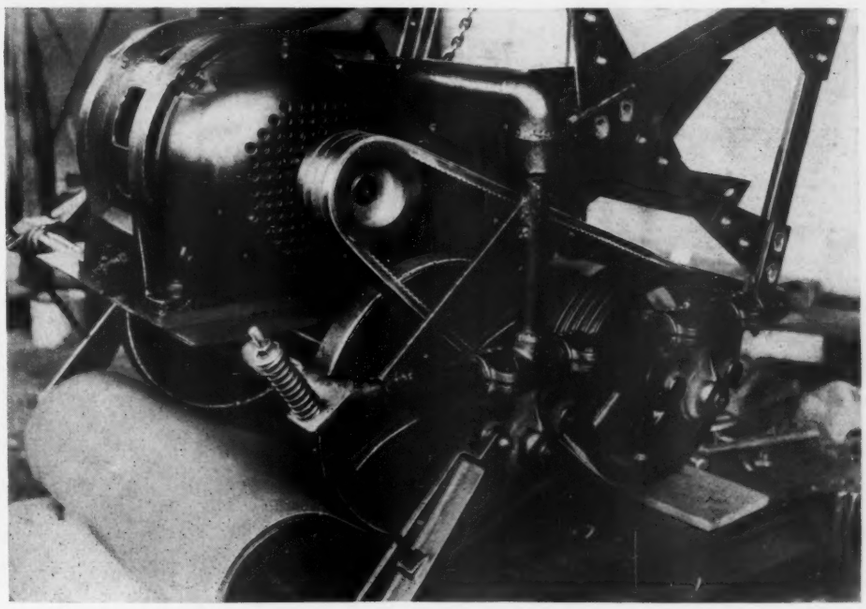
The "Green" being loaded by shuttle conveyor on shore but showing loading hopper used with derricks

Another boat of this same general type but of quite different design and construction from the usual sand carrier is the *Material Service,* which made its appearance on the Chicago waterfront in the summer of 1929. It was built at Sturgeon Bay, Wis., by the Leatham D. Smith Dock Co. and was designed especially for the carrying of sand and gravel from Lockport on the Chicago drainage canal to the Chicago yards of the Material Service Co. and also for dredging sand from the lake and delivering it on the Chicago docks. The most noticeable difference in appearance from the ordinary sand carrier is the low even deck line and the absence of any projecting stacks, pilot house or other deck structures, and the fact that it is self-propelled, though of barge appearance and without the customary stacks. In order to pass under the fixed bridges of the drainage canal, and also in order to pass under the bridges of the Chicago river without their having to be raised, it was designed with a 14-ft. 6-in. clearance.

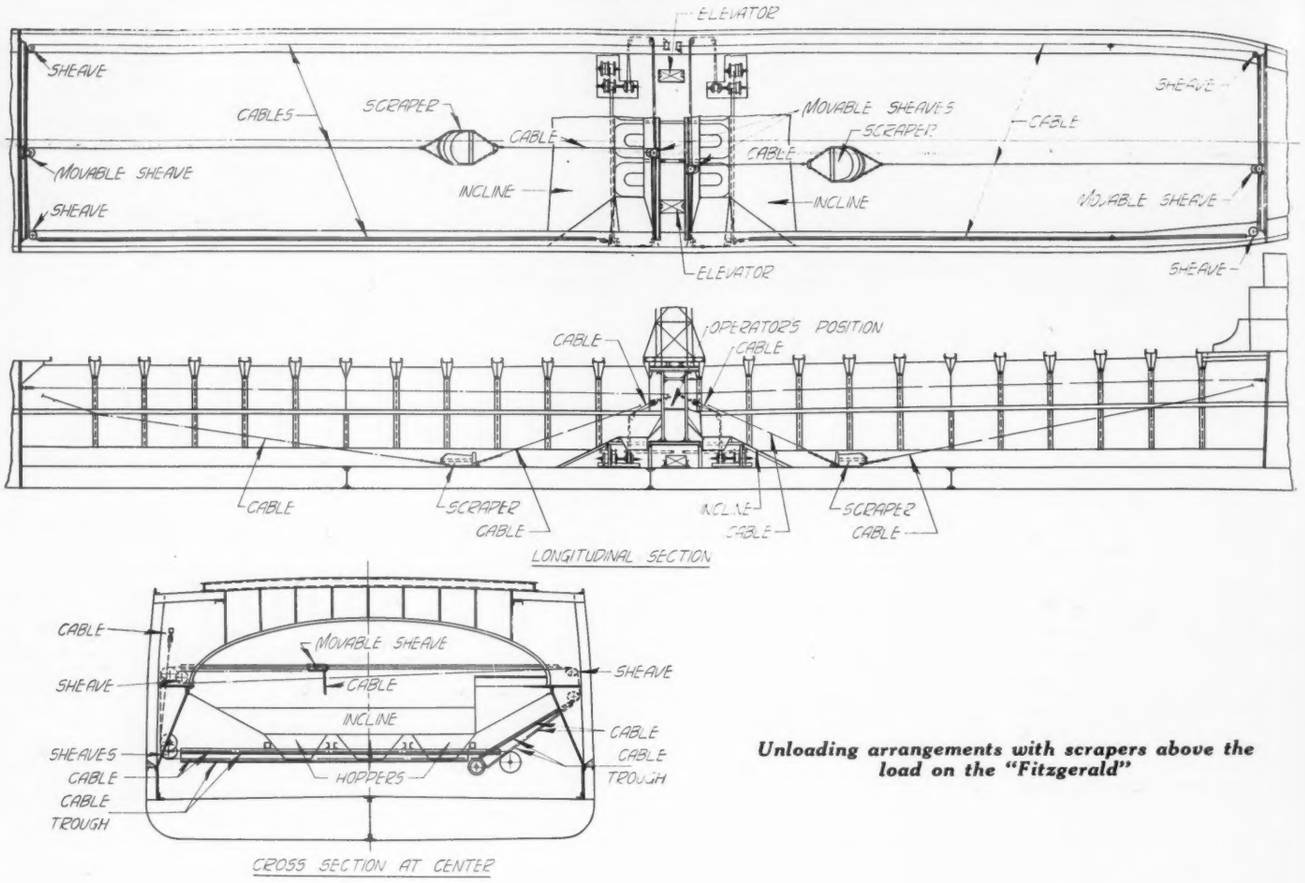
Power for propelling is furnished by two 350-hp. Winton Diesel engines driving twin propellers and controlled from the pilot house in the stern. They are arranged so that they may be disengaged from the propeller shafts to operate the loading and unloading equipment. The boat is 246 ft. long by 40 ft. beam, with a maximum cargo capacity of 2500 tons at 13 ft. draft, and has a speed of 10 miles per hour.

In the unloading operation two 4-yd. scrapers (Smith patented tunnel scraper system) in two parallel longitudinal tunnels in the hold scrape the material aft and up an incline to a hopper from which it is fed on to an inclined belt conveyor and from there to a 90-ft. boom conveyor, which discharges on to the dock.

The boom conveyor is swung from a jackknife A-frame which is folded down on the deck when passing under bridges. When used in the Lockport-Chicago service the vessel is loaded through the hatches in the usual way by a belt conveyor from shore, but when dredging sand a 15-in. pump driven from one of the Diesel engines is used in connection with dewatering boxes and the boom conveyor. In handling the boat the 800 tons of water ballast is pumped out by a centrifugal pump during the loading operation and allowed to run back in by gravity during the unloading. The boat can be loaded at Lockport in about five hours and unloaded in the same time.



View showing details of "thrower" used on the "Green"

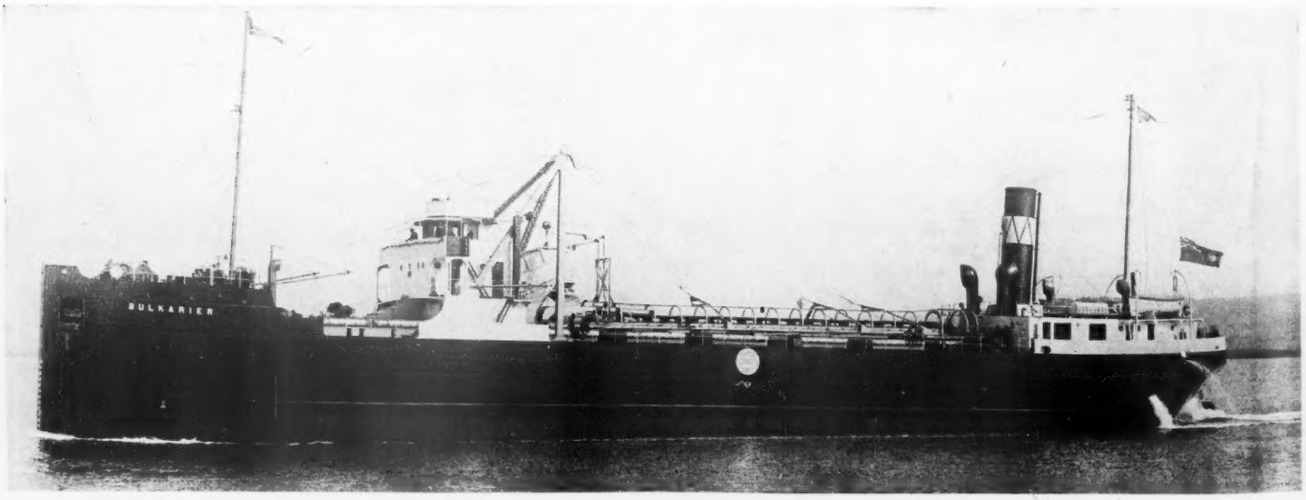


Unloading arrangements with scrapers above the load on the "Fitzgerald"

Other Types of Sand Carriers

The *Sandmaster* and the *Sandcraft,* operated by the Construction Materials Co., Chicago and used particularly for fill work along the Chicago waterfront, are of somewhat different arrangement, using pumps both for loading and unloading, instead of conveyors. The *Sandmaster,* which was built in 1925, is 263 ft. long by 43 ft. beam and has a cargo capacity of about 3000 tons of sand. It is of modern construction, Diesel engine powered and with full electrical control throughout. The *Sandcraft* is of the same general design and arrangement, but steam driven. On the *Sandmaster* two 600-hp. Worthington Diesel engines with direct-connected generators furnish direct current power at 240 volts for propelling and pumping. Two 500-hp., 130 r.p.m. motors drive the twin propellers. The two 18-in. sand pumps are driven by 400-hp. motors, and in the loading operation discharge to two launders with screen plates and dewatering boxes over the cargo space. In unloading, water is drawn in by the pumps and mixed with the sand to obtain the proper consistency for pumping.

The *Gilbert,* built in 1923 for the Lake Sand Corp., Chicago, makes use of pumps for loading, but has a traveling crane and clamshell bucket, with boom belt conveyor, for unloading. It has a cargo capacity of 1000 cu. yd. in two pockets, which are filled by two 12-in. Morris pumps discharging to sluiceways with screen plates above the cargo space. In unloading, the sand is picked up in a clamshell bucket operated from an overhead structural frame and is emptied into

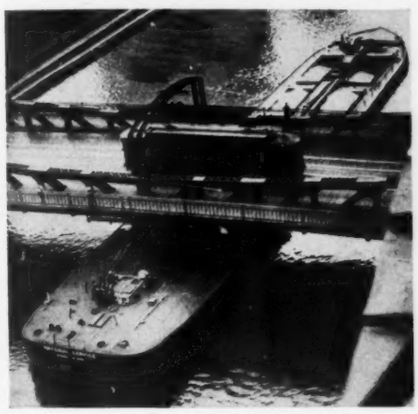


The "Bulkarier" is equipped to handle either bulk cement or gypsum rock

a hopper from which it is fed to a 40-in. by 82-ft. boom belt conveyor. Unloading is done in about two and one-half hours.

In addition to these, some 18 or 20 boats ranging from 1000 to 2500 tons cargo capacity, and with clamshell buckets operated on derrick booms, are used on the Great Lakes for handling sand and coal. One of these, using clamshell buckets, the *Fred W. Green*, has been equipped in an interesting way to reduce the unloading time and also to increase the area over which the material can be unloaded on the dock.

The *Green* has a cargo capacity of about 2500 tons and has been used principally in transporting sand from Charlevoix, Mich., to other lake ports. It was originally equipped with two steel derricks handling 2½-yd. clamshell buckets for loading and unloading.



The "Material Service," a Diesel engine driven self-unloading boat

These have been retained and are still used for both loading and unloading, but in order to save the time of the long swing of the derricks from the hold to the shore and back and also to increase the piling area on shore, conveying equipment was added for the unloading operation. This consists of a deck conveyor with movable loading hoppers and a 36-in. by 100-ft. swinging boom and belt conveyor which has an auxiliary conveyor or "thrower" at its discharge end.

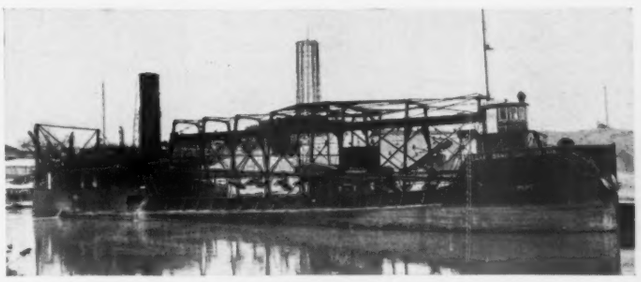
The boom conveyor is located forward of the bridge and arranged so that it may be swung ahead, thus giving the boat the added advantage that it may be headed in to shore and unloaded in quite shallow water without danger of fouling the propellors. With this equipment the vessel can be unloaded at the rate of 600 tons per hour.

The auxiliary conveyor or "thrower" at the end of the boom conveyor is similar to one type of box car loader and consists of a short high-speed belt conveyor. The belt is driven at a speed of 1800 f.p.m. and its upper run is held in a concave curve by a disc at each edge so that centrifugal force holds the material against the belt. It is driven by an enclosed 10-hp. motor and cog belt drive and is pivoted at the end of the boom so that it may be swung up out of the way when not being used. In this way part of the load may be thrown beyond the pile normally made by the boom conveyor and the width of the pile increased at least 20 ft. This equipment was furnished by the Stephens-Adamson Manufacturing Co.

The "J. M. Kennedy," a drag scraper type boat

Self-Unloading Bulk Cement Carriers

Boats carrying cement in bulk, with a total cargo capacity of more than 180,000 bbl. or 35,000 tons, and equipped with self-unloading equipment, are operated by a number of the cement manufacturers on the Great Lakes, the Mississippi river, the Atlantic Coast and in Cuban waters. Of this cargo capacity more than 70% or approximately 125,000 bbl. is on the Great Lakes.



The "Gilbert" has pumps and a traveling crane and clamshell bucket

Here the Huron Portland Cement Co., Petoskey Portland Cement Co., Manitowoc Portland Cement Co. and Canada Cement Co., transport bulk cement in this fashion in self-propelled boats, while the Peerless Cement Corp. uses two barges to carry cement from its Port Huron plant to Detroit.

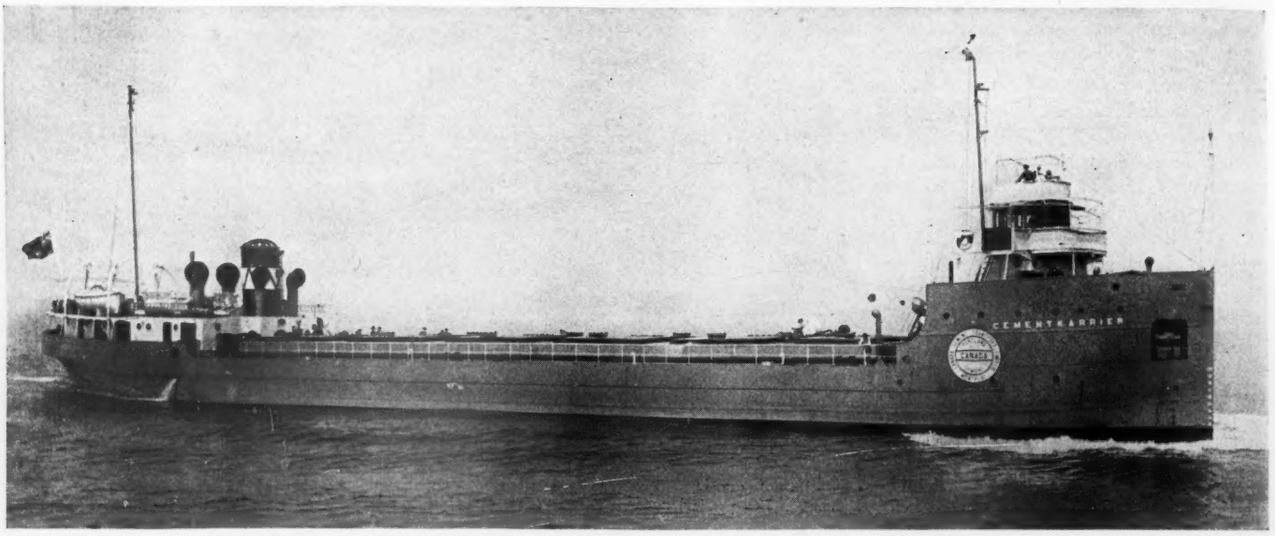
This method requires storage silos at the point of delivery, from which the cement is later shipped out to the users by trucks or short rail hauls.

Such a system would seem to have a number of advantages; particularly, in lower transportation and handling costs as compared with long rail hauls; and in extending the area which which may be served by the plant.

The Huron Portland Cement Co. was the first to engage in this method of transporting and unloading; first, with the *Samuel Mitchell*, then adding the *John W. Boardman*, and later, in 1927, the *S. T. Crapo*, handling cargoes from the plants at Alpena and Wyandotte to storage and packing plants at Buffalo, Cleveland, Detroit, Milwaukee and Duluth, and later at Toledo.

The *Mitchell* has a cargo capacity of approximately 13,000 bbl.; the *Boardman*, 35,000 bbl.; and the *Crapo*, 40,000 bbl. These boats were all arranged with hopper bottom bins feeding to longitudinal screw conveyors and cross screw conveyors in the bottom of the hold, these conveyors feeding in turn to a bucket elevator at the end, from which the ce-

The "E. M. Young," the largest drag scraper type boat



The "Cementkarrier," Diesel engine driven, makes use of drag scrapers and a Fuller-Kinyon pump

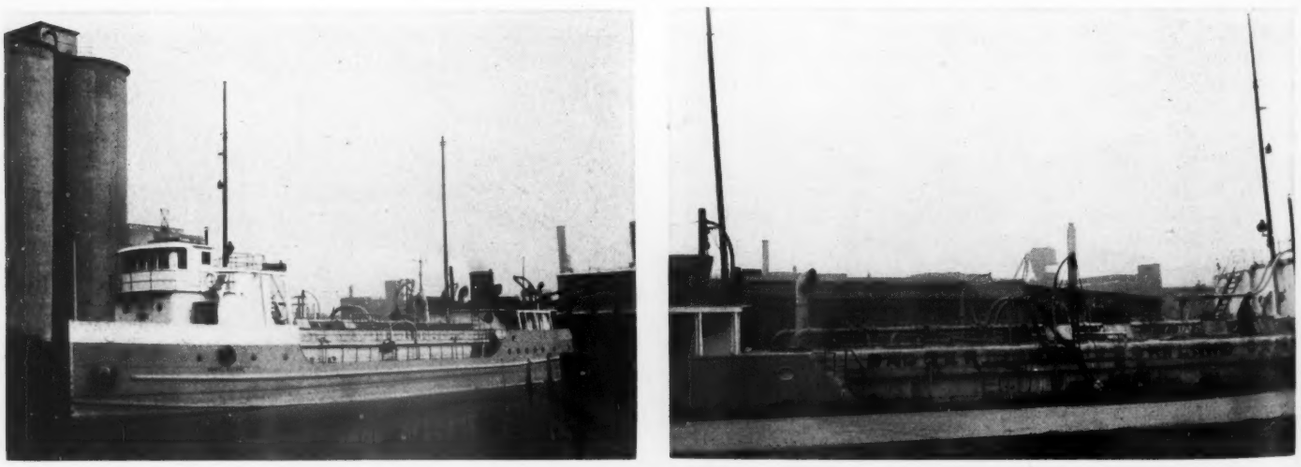
ment is carried on a movable screw conveyor to the receiving hopper at the silos on shore. From there it is carried up to the top of the silos in a large steel cased bucket elevator and distributed to the different silos by screw conveyor. These conveyors and elevators permit of unloading at the rate of about 1500 bbl. per hour. Such unloading arrangements apply to the silos at Buffalo, Cleveland, Detroit and Milwaukee. The new packing plant at Toledo, completed in June, 1929, is arranged with pipes up over the silos and the Fuller-Kinyon pumping system is used in unloading. The Duluth plant has also had pipes added to the elevator and conveyor system so that either system may be used. Along with these provisions for the use of the pumping system, the *Crapo* was equipped with two 10-in. Fuller-Kinyon pumps so that either method of unloading might be used. Two 8-in. shore pipes are used in connection with these pumps, the length of which in the case of the Toledo plant is 270 ft. The pumping system permits of unloading at that rate of 2,000 bbl. per hour. At the Alpena plant these boats can be loaded at the rate of 5,000 to 6,000 bbl. per hour by a battery of seven screw conveyors which are run out over the boat and discharge into the hold through a number of flexible spouts.

First Boat to Use Fuller-Kinyon System

While not as large as some of the other boats, the *Daniel McCool,* operated by the Manitowoc Portland Cement Co., between its plant at Manitowoc, Wis., and packing plants at Milwaukee and Chicago, is interesting as being the first to use the Fuller-Kinyon pumping system for loading and unloading bulk cement. It is also of interest as being equipped with Diesel engines, both for propulsion and for operating the unloading machinery. It was built new by the Manitowoc Shipbuilding Company for this service in 1926 and was described in Rock Products October 15, 1927.

The *McCool* carries a cargo of 4,000 bbl. of bulk cement and is loaded in 5 to 6 hours through two 6-in. pipes about 475 ft. long by two 8-in. Fuller-Kinyon pumps at the plant. The cargo space is divided into six compartments arranged with hopper bottoms and from which two parallel longitudinal 14-in. screw conveyors are fed. These carry the cement aft to two 8-in. Fuller-Kinyon pumps. Rotary feeders are located about 4 ft. apart along the conveyors and control the flow of cement from the bins. From the pumps the cement is discharged to the silos through two 5-in. pipe lines about 250 ft. long. Unloading is at the rate of 700 bbl. per hour. The discharge lines come out amidship and are connected with the shore lines by flexible metal hose. Bolted flanged connections with gaskets are used.

The power plant consists of two 240-hp. Fairbanks-Morse Diesel engines, which are connected through clutch couplings with the two propeller shafts, and have two 200-kva. Fairbanks-Morse generators direct-connected on the forward end. When lying at the dock the clutches are disengaged and the generators furnish power for the unloading machinery. The Fuller-Kinyon pumps



Two views of the "Daniel McCool," from which bulk cement is unloaded by means of screw conveyors and Fuller-Kinyon pumps

The "J. B. John" unloading bulk cement

are driven by 175-hp. motors, and air is furnished by two air compressors with 100-hp. synchronous motors. In the forward end of the boat two 3-tube Bates valve bag packers are installed, in connection with a reversible shuttle belt conveyor, so that bagged cement may be discharged on to the dock at either side. The *McCool* and the *Crapo* are believed to be the only two boats having this feature.

The *J. B. John,* operated by the Petoskey Portland Cement Co. from its plant at Petoskey, Mich., to packing plants at Milwaukee, Chicago and Detroit, was converted to a self-unloader in 1929 by the Manitowoc Shipbuilding Co. It had previously been used in carrying cement in bags, being loaded by a system of belt conveyors. The change consisted in putting in hopper-bottom bins, screw conveyors and Fuller-Kinyon pumps. The bin compartments are emptied through rows of rotary feeders to four parallel longitudinal screw conveyors which carry the cement forward to two short cross screw conveyors feeding two 8-in. Fuller-Kinyon pumps. The feeders are about 4 ft. apart along the conveyors, each with a clutch, and gear driven from a long shaft.

The two pumps are each driven by a 175-hp. 900-rpm. General Electric motor, and each of the two sets of conveyors by a 100-hp. General Electric motor through a Link-Belt speed reducer. Two 1000-c.f.m. Sullivan air compressors with direct connected 175-hp. General Electric synchronous motors supply air for the pumping operation. Power for this equipment is supplied by two 500 kva., 3-ph., 60-cyc., 480-v. General Electric turbo-generators, these units being aft with the triple expansion steam propelling engine, and the balance of the equipment forward.

The *John* carries 13,000 bbl. of bulk cement which is unloaded in about 13 hours, or at the rate of 1000 bbl. per hour. This is done through two 6-in. pipe lines with flexible hose connection between the boat and the short lines. The length of these shore lines is from 315 ft. to 460 ft. Loading from the plant at Petoskey is done by two 10-in. Fuller-Kinyon pumps at the rate of 1400 bbl. per hour, or in 9 to 9½ hours. The two 8-in. pipe lines from the pumps to the boat are about 800 ft. long. The pumps are driven by direct connected 300-hp. Allis-Chalmers induction motors, and are supplied from the silos by four longitudinal 18-in. Link-Belt screw conveyors with cross screw conveyors, all roller chain driven through Huron speed reducers by two 60-hp. Allis-Chalmers induction motors. These loading arrangements were described in Rock Products November 8, 1930.

The two tow barges used by the Peerless Cement Corporation, Detroit, are each equipped with a 7-in. Fuller-Kinyon pump, but have quite different arrangements than those so far described, for feeding the pump. Here a drag scraper working over the top of the load scrapes the bulk cement to a hopper above the pump in the forward end. These barges each carry 4,000 bbl. of bulk cement, which is unloaded at the rate of 350 bbl. per hour. Power for operating the unloading equipment is provided from shore.

The Universal-Atlas Cement Co. put into service late in 1930 a steel tow barge with self-unloading equipment for use in the Chicago and Milwaukee district.

This barge, embodying the most modern practice, is 226 ft. long by 40-ft. beam and has an overhead clearance of only 12½ ft., which permits passing under city bridges without raising them. It has a carrying capacity of 9,000 bbl. of cement and makes use of the tunnel scraper system in connection with a Fuller-Kinyon pump, by means of which the cargo may be unloaded in about 10 hours.

A single tunnel is used, in which a 4-yd. scraper, operated by a motor-driven hoist and cables, carries the material to a hopper feeding a 10-in. Fuller-Kinyon pump. The hoist is arranged with an air controlled clutch and is driven by a 100-hp. motor. The Fuller-Kinyon pump is driven by a 150-hp. direct-connected motor, while compressed air is furnished by a 1200-c.f.m. Bury air compressor driven by a 225-hp. direct-connected synchronous motor. General Electric motors were used throughout.

Three-phase, 60-cycle, 440-volt electric current is provided from shore through flexible cable and plug connections.

Of interest is the use of a 5000-c.f.m. Parson-Thompson dust collector to care for the dust made during the unloading operation.

The barge "Mariel," which delivers bulk cement to Havana

Also this is the first installation to use a 10-in. pipe line, the 10-in. line 1,100 ft. long used for loading at the Buffington plant being the largest and longest so far installed.

The Canada Cement Co., Montreal, operates two boats, the *Bulkarier*, and the *Cementkarrier*, for the transportation of bulk cement.

The *Bulkarier* is a converted boat which was put in service in 1929, and is used to transport bulk cement from the plant at Montreal to Halifax, St. Johns and other New Brunswick and Nova Scotia points, and return gypsum rock to the plant. In handling bulk cement it is loaded at Montreal at the rate of about 1,250 bbl. per hour by a 10-in. Fuller-Kinyon pump discharging through 470 ft. of 8-in. pipe line. It has a carrying capacity of 12,000 bbl. of cement. The construction and unloading arrangements of these boats are different from some of those already described in that they are both equipped with the tunnel scraper system. The *Bulkarier* has two longitudinal tunnels with two 6-yd. scrapers which drag the material up an incline to a hopper from which it is fed to a 48-in. inclined belt conveyor discharging on to a 48-in. by 90-ft. boom belt conveyor.

The *Cementkarrier*, put into service in August, 1930, by the same company is probably the most modern bulk cement carrier now in service, with a particularly fine automatic electric control system. It is used to carry cement to packing plants at Toronto and Windsor, and has a cargo capacity of 12,000 bbl. Two 500-hp. Diesel engines, direct connected to General Electric direct current generators, provide power for both propulsion and unloading. The 775-hp. 100-rpm. double armature type motor used on the propeller shaft is controlled from the bridge by the Ward-Leonard system of control and motor driven field regulators. The cargo space is divided by a longitudinal center partition and cross partitions into three hoppers on each side to prevent shifting of cargo.

Two 4-yd. Sauerman scrapers operated by 100-hp. electric motor driven hoists, scrape the material through the two tunnels and up an incline to the hopper feeding the Fuller-Kinyon pump. This is a 10-in. pump with 300-hp. motor, which discharges the cement through an 8-in. line about 370 ft. long at the rate of 1400 bbl. per hour. Compressed air is supplied by two compressors with 200-hp. motors, delivering 1,850 cu. ft. of air per min. Both boats were described in Rock Products, June 6, 1931.

On the Mississippi river, the Marquette Cement Manufacturing Co. uses four tow barges for carrying bulk cement from its plant at Cape Girardeau, Mo., to packing plants at Memphis and St. Louis. These were put into service in 1929 and are of the type previously described, with screw conveyors carrying the bulk cement to a Fuller-Kinyon pump. The barges are 175 ft. long by 35 ft. beam and the cargo space is divided into three longitudinal hopper bins 144 ft. long. Under these are three 12-in. longitudinal screw conveyors connected with a cross conveyor which feeds a 6-in. Fuller-Kinyon pump driven by a 75-hp. motor. Each barge carries 4,000 bbl. of bulk cement which is unloaded at the rate of 200 bbl. per hour through a 5-in. line. A modern tug boat, the *William Dickinson*, with two 350-hp. Atlas Imperial Diesel engines driving twin propellers is used to tow them.

On the Atlantic coast the Lone Star Cement Co., Virginia, Inc. (a subsidiary of International Cement Corp.), uses a tow barge, the *Lone Star No. 1*, to carry bulk cement from the plant at Norfolk, Va., to Washington, D. C. This is also equipped with screw conveyors and Fuller-Kinyon pumps. It was put into operation during the summer of 1929 and carries a cargo of 4000 bbl. Two 8-in. Fuller-Kinyon pumps, fed by screw conveyors from hopper bottom bins in the manner already described, and driven by 125-hp. motors, discharge the cement through two 6-in. pipe lines about 350 ft. long. Unloading in this manner is at the rate of 900 bbl. per hour.

The Cuban Portland Cement Corp. (also a subsidiary of the International Cement Corp.) uses three boats of the same type to transport cement from its plant at Mariel to Havana and Nuevitas, Cuba.

The *H. Struckmann* is a self-propelled boat of 4000 bbl. capacity, running to Nuevitas, and is equipped with three 8-in. Fuller-Kinyon pumps which permit unloading at the rate of 1,000 bbl. per hour.

The *Mariel* and *Morro*, unloading at the Havana packing plant, are tow barges of 5,000-bbl. capacity with two 8-in. Fuller-Kinyon pumps. These unload at the rate of 700 bbl. per hour through two 6-in. pipe lines about 195 ft. long. All three boats have hopper bottom bins with screw conveyors below, which carry the bulk cement to the pumps.

The boat of the car ferry type used by the Hercules Cement Corp. for delivery in New York harbor is unlike any of the others. Here eight of the cement company's special closed hopper cars, each carrying 400 bbl. of cement, are run on to the boat and emptied into track hoppers from which the bulk cement is carried by screw conveyors to two 6-in. Fuller-Kinyon pumps. In this way the 3,200-bbl. cargo is unloaded at the rate of 225 bbl. per hour.

Of the 19 bulk cement carriers mentioned the nine which are self-propelled have a carrying capacity of 136,000 bbl. or 75% of the total, while the remaining 47,000 bbl. capacity is in ten tow barges.

The six self-propelled bulk cement carriers operated on the Great Lakes account for almost two-thirds of the total capacity, with the three boats of the Huron Portland Cement Co. making up practically half of the total.

Sixteen of the nineteen cement carriers have Fuller-Kinyon pumping systems so that about two-thirds of the bulk cement carrying capacity may be unloaded through pipes in this way, the balance being handled with bucket elevators on two boats and on a belt conveyor on the third.

Fourteen boats representing 77% of the total carrying capacity are arranged with hopper bins and screw conveyors, while the two Canadian boats and the Universal barge use the Smith tunnel scraper system, and the two Peerless barges have scrapers working over the load. Thus the use of screw conveyors to reclaim the cement from the hold and Fuller-Kinyon pumps to put it ashore seems to have been most in favor. Although requiring several times as much power as the bucket elevator and conveyor method, the pumping system has the advantages of convenience, cleanliness and lower cost of maintenance. The 10-in. pumping units handle anywhere from 500 to 1,000 bbl. per hour depending on the length of the pipe line, the 8-in. unit from 350 to 500 bbl. per hour, and the 6-in. unit about 200 bbl. per hour.

Properties of Some North Dakota Bentonites

ALTHOUGH it has been known for many years that there are deposits of excellent clays in numerous sections of western North Dakota, no comprehensive and detailed study of the extent and nature of these deposits has ever been made. The Division of Mines and Mining Experiments of the state university has begun an extensive survey of these deposits. During the field work on this survey in the summer of 1930, W. E. Budge located a large deposit of bentonite in the beds of the White river formation in southwestern Stark county.

About 32 sections contain bentonite and the deposits range from a few feet to 30 ft. in thickness. The deposit nearest the railroad is four miles away, with good haulage conditions. Much of the material has no cover and can be obtained easily.

A report on this deposit by Freida L. Hammers and W. E. Budge in a recent issue of the *Journal of the American Ceramic Society* gives the results of tests made on seven samples of North Dakota bentonites. An attempt was made to classify them and to determine their absorptive and water-softening powers.

The conclusions reached in this report were that: The degree of swelling in water would indicate that the seven North Dakota samples tested are alkali bentonites. Failure to obtain really high temporary osmotic pressures and high dye-absorption values would make this classification uncertain; and the dye-absorption ratio is not altered on firing to 520 deg. C. in most cases.

Fired bentonites which have been treated first with sulphuric acid and then with saturated sodium chloride solution are most effective in reducing hardness in water.

Modern Plant Designed to Make Road Gravel Exclusively

Western Sand and Gravel Co., Spring Valley, Illinois, Makes No Concrete Aggregate: Some Distinctive Features

IN ORDER to satisfy the public demand for smoother, wider and more lasting highways the various state highway departments, in their search for ways of building better highways, have insisted on stricter specifications for concrete aggregate. This is too well known by the producers to need any elaboration here.

However, it is to be noted that not only are the stricter specifications for concrete aggregates calling for changes in plant design, better operating methods and closer supervision, but the more exacting requirements for highway material have been extended into the field of secondary road construction. Especially is this noticeable in the state of Illinois.

No longer is it practicable to take pit-run gravel containing a little clay and send this out for secondary road construction. This material must meet certain specifications, and to be produced economically, a suitable screening and sizing plant is necessary.

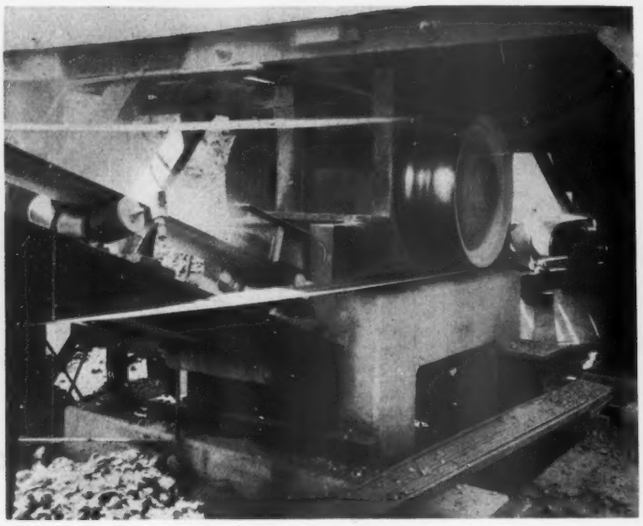
The Western Sand and Gravel Co., Spring Valley, Ill., some six miles west of LaSalle, Ill., has for several years been a shipper of gravel for secondary road construction. Its pit gravel is of glacial origin and like many of the central Illinois deposits it contains some clay. The deposit is of such a character that the owners did not deem it advisable to try to make concrete aggregate from the material but decided to be satisfied with a well graded mix that could be varied to meet any of the four specifications of the state of Illinois for traffic-bound, road-building material. Accordingly they called upon the Robins Conveying Belt Co. to assist them in the design of a plant that would represent a reasonably low first cost and could be cheaply operated. The plant, of wood-frame construction, was placed in operation at Spring Valley early in 1931.

The outstanding features of this plant are: (1) no washing is done; (2) no storage bin or ground storage is provided, as the material is loaded direct to railroad cars; (3) only one class of material can be made at one time, although any specification can be met by varying the screen sizes; (4) the excess sand and fine material is discarded as the first step in the screening operation.

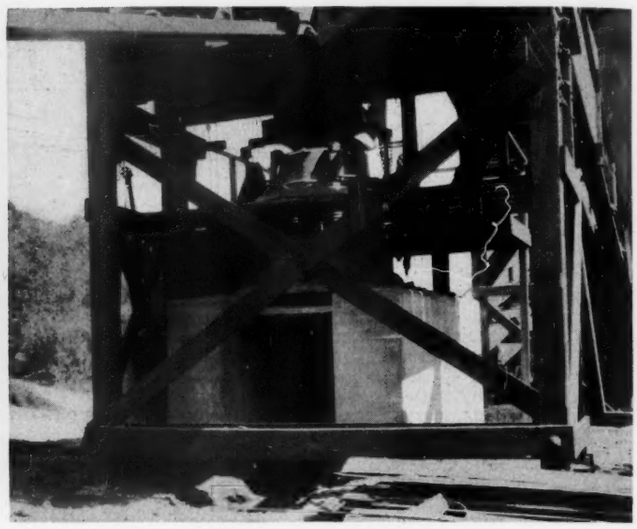
A Telsmith jaw crusher is used to break the oversize down to 3½-in. size and the material then passes to a 3-ft. Symons cone crusher which can reduce the gravel down to as low as 100% minus ⅝-in. size.

While the raw material contains some clay, it is easily possible by selective loading at the pit and by an accurate control of the amount of material going to the sand stock pile to keep the clay content below the state requirement of not more than 5%. The bank material is loaded by a 1½-yd. crawler mounted Marion electric shovel to 5-yd. side dump cars, which are hauled to the plant two or three at a time by a Whitcomb gasoline locomotive. This is a short haul, about 100 yd., with a down grade to the plant, and a quite steep up-grade for the empty cars, but the locomotive easily handles the load.

View of plant from loading point. The excess fines are stacked at the left



Jaw crusher for coarse crushing



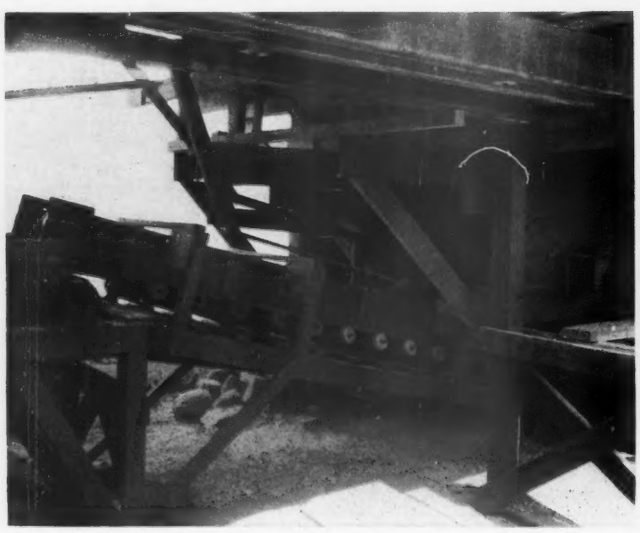
Cone crusher for fine crushing

At the plant the cars are dumped to a horizontal grating made of 3-in. angles on 10-in. spacing and mounted over a wooden hopper serving the primary feeder belt. The feeder belt is slightly inclined and discharges to a 36-in. inclined belt conveyor that takes the sand and gravel to the top of the plant. There it is discharged to a third (42-in.) horizontal belt conveyor, which serves the vibrating screens. The flow sheet shows the arrangement of these belts which are driven by a single 15-hp. General Electric motor.

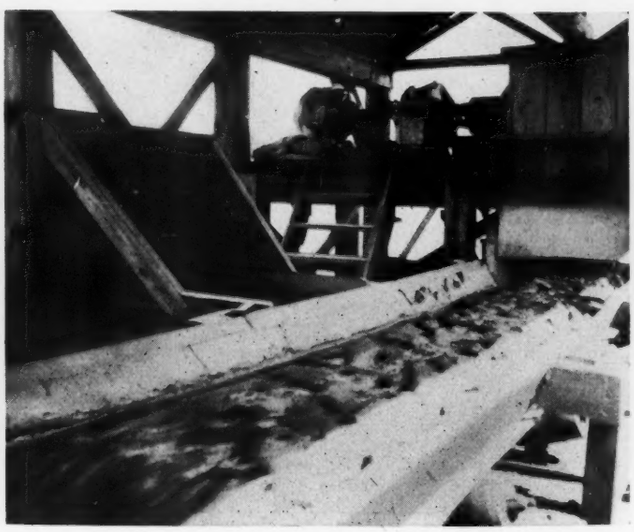
An unusual feature in this plant is that the upper of the two vibrating screens (which are in tandem and both are double-decked) has the smaller meshed wire cloth. In other words, the upper vibrator has a top deck of 1½-in. by ¾-in. mesh wire cloth and a bottom deck of ¼-in. mesh cloth. The lower vibrator has a top deck of 3½-in. wire cloth and a bottom deck of 1-in. wire cloth.

This means that pieces of gravel which will pass the primary grating (10-in. centers) pass over the top of the 1½-in. mesh screen and then over the 3½-in. screen below. In passing over these two screens the flow is retarded by three swinging baffles placed at the head of the lower screen as shown in illustration. Although this method of put-

Electric shovel used for loading in pit



Belt conveyor feeder below track hopper



Short belt conveyor which feeds upper screen

The lower vibrating screen

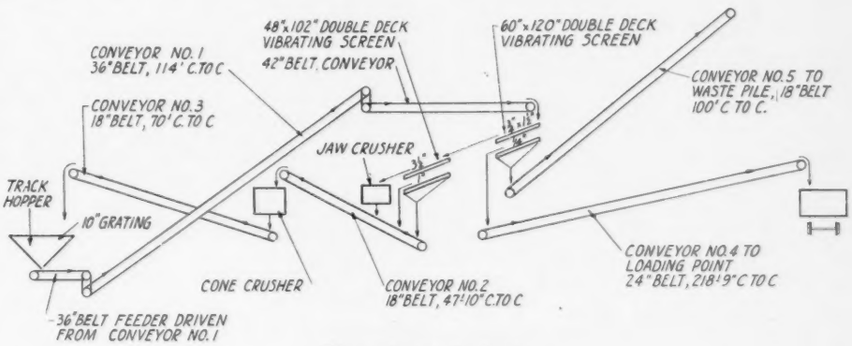
The upper vibrating screen

ting such large pieces of gravel on to the small meshed cloth first may have drawbacks this operation seems to get reasonably good results by such a procedure.

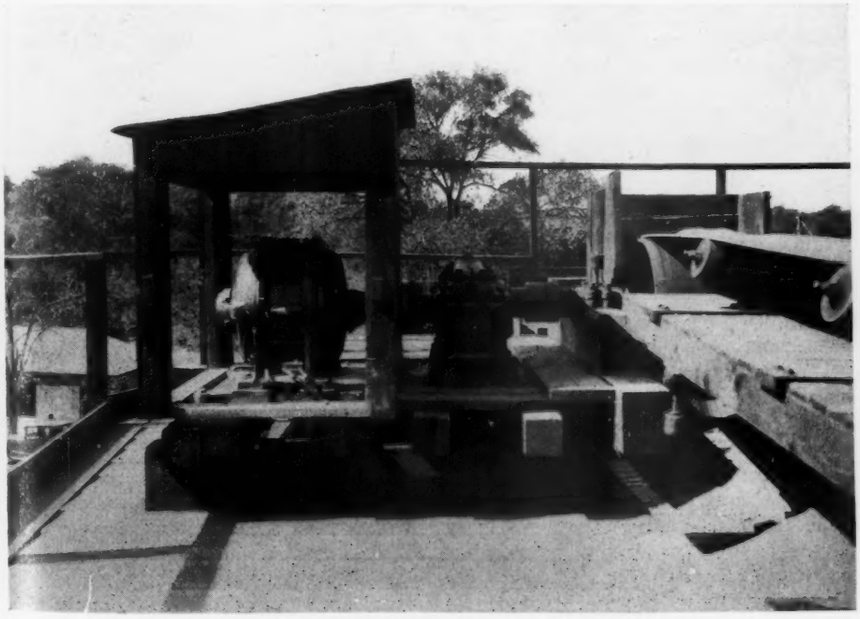
All of the oversize from the upper screen passes to the lower vibrating screen where it is divided into two products. The larger oversize falls direct to a No. 12 Telsmith jaw crusher set to discharge a 3½-in. product. This product is discharged to an 18-in. inclined belt conveyor which delivers the material direct to a 36-in. Symons cone crusher. The material from the lower deck of the lower screen bypasses the jaw crusher and is also carried to the cone crusher by the same 18-in. belt conveyor.

The upper vibrating screen makes three products: the oversize, as described in the previous paragraph; a sand, which is discharged by an 18-in. inclined belt conveyor to a storage pile alongside the plant; and the marketable material. The excess sand is not considered as waste as it is expected to wash and recover it later. The marketable material is that which passes over the lower deck of the upper vibrating screen. This product falls to a wooden hopper serving a long, slightly inclined, 24-in. belt conveyor which delivers the material to a point over the railroad siding. The upper vibrating screen is a 60- by 120-in. two-decked Robins Gyrex screen.

The lower vibrating screen is of the same


48"x102" DOUBLE DECK VIBRATING SCREEN
42" BELT CONVEYOR
60"x120" DOUBLE DECK VIBRATING SCREEN
CONVEYOR NO. 1 36" BELT, 114' C.TO C
CONVEYOR NO. 3 18" BELT, 70' C.TO C
CONVEYOR NO. 5 TO WASTE PILE, 18" BELT 100' C TO C.
JAW CRUSHER
TRACK HOPPER
10" GRATING
CONE CRUSHER
CONVEYOR NO. 2 18" BELT, 47'10" C.TO C
CONVEYOR NO. 4 TO LOADING POINT 24" BELT, 218'9" C TO C
36" BELT FEEDER DRIVEN FROM CONVEYOR NO. 1

Flow sheet of plant



Drive end of the car-loading conveyor

make as above but is a model 48 by 102 and has a 3½-in. top deck with a 1-in. wire-cloth lower deck.

The plant is electrically driven throughout by various motors either direct-connected through Jones gear reduction units or through V-belt drives. With one exception, all the motors are General Electric, the exception being a 75-hp. Fairbanks-Morse motor driving the Symons cone crusher. The belting was supplied by the Robins Conveying Belt Co., which also supplied the carrier and return rolls. All of the bearings on the head and tail pulleys, carrier and return rolls, etc., are Alemite lubricated.

The plant was designed for a capacity of 270 tons per hour and it was estimated that 70 tons per hour would have to be put through the cone crusher and roughly 30 tons per hour through the jaw crusher.

The offices of the company are at Spring Valley, Ill.; the president and general manager is J. C. Sitterly; the vice-president and secretary, Glenn Sitterly, and the superintendent, Lyle Sitterly.

Economics of the Nonmetallic Mineral Industries*

Part XI—Transportation Characteristics and How They Affect Prices and Values

By Raymond B. Ladoo

Manager of the Industrial Commodities Department, United States Gypsum Co.

THE ECONOMIC VALUE of most nonmetallic mineral deposits today more than ever before is very largely dependent upon transportation facilities. The type, availability, cost and general character of the means of transporting raw materials to a plant and finished products to markets are extremely important. Where bulk commodities are sold in large volume at a low price and with a low margin of profit, the freight charges to market are often more than the selling price at the plant. Slight savings in transportation cost often mean the difference between profit and no profit, or loss.

Let us begin at the marketing end of the problem, for here, as in most nonmetallic mineral problems, the marketing is the most important. We have today three principal means of transporting bulk mineral products from quarries or plants to the markets —rail, water and motor truck. Rail transportation of course is and probably always will be the backbone of all haulage to market of bulk materials. Water transportation is the oldest but long neglected method of reaching markets. Today, particularly through the use of coastwise and inland waterways, boats and barges are again assuming important places in our marketing picture. Motor trucks have not only largely replaced freight cars on short and medium length hauls, but they have done far more. They have revised the whole economic structure of the country. They have completely changed methods of buying and the distribution of marketing centers; they have created new markets which did not exist before and which would not exist again if motor trucks were eliminated.

Railroad Transportation

Probably little new can be said on this subject, yet important facts in railroad traffic problems are often overlooked by even very large companies. The essential features of any haulage service to markets are discussed briefly below.

1. *FREIGHT RATES AND MINIMUM CARLOADS*—The freight rate or cost per ton is, of course, the all-important factor. Yet the mere fact that a published rate is satisfactory now is by no means all of the problem. Many other questions must be asked. On what minimum weight carload is this rate based; is that minimum satisfactory to both producer and consumer; how does the rate and minimum carload compare with those from other competing producing points; is the rate applicable to the type of equipment most used; is there an additional switching or delivery charge when delivery is made at destination point over tracks of other than the originating road?

An erroneous or incomplete understanding of published freight rates often results in the quotation of wrong delivered prices and loss instead of profit on a single sale or even on a contract running for a considerable period. For example, the rate on ground limestone between two points might be 12c per cwt. on a 60,000-lb. minimum carload and 14c on a 40,000-lb. minimum carload, a difference of 40c per ton. A close delivered price based on the 12c rate might be made to a customer who orders only 20 tons and this 40c per ton difference might mean a loss on the whole transaction instead of a moderate profit. Or, again, a rate on crushed stone might apply only on open-top cars, and a customer for some special reason might want a box car shipment. A delivered price based on the open-top car rate might easily result in a loss to the producer. These cases occur very often.

In a large city served by several railroads it often happens that a customer's delivery point is on a different road from the producer's plant. The producer may have a one-line haul over the A. B. and C. railroad from his plant at Falls Creek to his customer's city, Boontown, and a favorable freight rate based on that haul. But the customer's plant may be on the M. N. and O. railroad and there may be a delivery charge of $8 per car to transfer from the A. B. and C. to the M. N. and O. railroad. A delivered price based on the simple freight rate from Falls Creek to Boontown, and overlooking the $8 delivery charge, may cut off most of the profit on a low-priced commodity.

2. *COMPETING RAILROADS*—A very important point in locating a large plant producing a bulk, low-priced commodity is whether it will be served by a single railroad or whether shipments may be made over two or more roads. There is an immense advantage in having two or more railroads over which products may be shipped. This competition helps in the making and maintaining of favorable freight rates, is a partial insurance against car shortages, provides alternative routing to many consuming points, insures a single-line haul to many more points, with all its attendant advantages, and improves the general shipping conditions in many other ways. Of course, it is not always possible to choose a plant site accessible to two or more railroads, but it is a problem always worth considerable study.

3. *SPEED OF TRAVEL AND TIME IN TRANSIT*—The speed of freight travel or time of cars in transit to principal destinations may or may not be important. This depends on the commodity produced, location of competitive plants, nature of competition and so on. Sometimes it is of considerable importance. One actual example may illustrate this point. A large portland cement company had a choice of three sources of gypsum to be used as retarder for its cement. The freight rates from the three points were the same and the distances approximately the same. Prices at all producing points were the same. Two of the gypsum mines, *A* and *B*, were about equal in

Editor's Note

***ROCK PRODUCTS** in the ground are worth practically nothing. Most operators and would-be operators appreciate fully that the costs of taking them out of the ground and preparing them for the market must be recovered in the sales price.*

But another equally important element of the selling price is the cost of transportation. There are many angles to transportation, some of them seldom considered until the producer is confronted with a condition which annihilates his expected profit.

These are the points considered by the author—possible differences in rates due to minimum carloading rules, speed of travel and time in transit; weighing shipments; single-line vs. multiple-line hauls. —The Editor.

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quality and preparation, but the third was of somewhat lower grade and less well prepared.

Now, it happened that this cement plant had little or no adequate storage for gypsum —only a small bin holding less than a day's requirements—and consequently it was desirable that the gypsum shipments come with great regularity. The actual time in transit did not matter much when cement production was at a steady, uniform rate, but when rush orders were received and one or two more clinker grinding mills had to be started up, more gypsum was needed in a hurry.

The haul from plant *C* was a single-line haul with delivery by the same line, while from plants *A* and *B* the cars moved over several lines and through one or more congested freight yards. Consequently shipments from plant *C* were only about two days in transit, while from plants *A* and *B* they were three or four or even five days on the road. The result was that the poorer rock from plant *C* got the preference, and this cement company could hardly be persuaded to take rock from the other plants even in emergencies. While a new plant cannot usually be located with this point in mind, yet it is surely a consideration in studying competitive conditions.

4. *CAR SERVICE AND WEIGHING POINT*—Fortunately car service on most railroads is very good today, yet this has not always been the case and may not always be so in the future. Some railroads do not have enough cars of certain types to satisfy the needs of large shippers, and they are forced to depend on foreign line cars. When a plant is located on a small railroad or on an unimportant branch of a larger road, this condition may be very serious. Often rush orders come in by phone or wire, "Must ship today sure. Wire car numbers and trace." The unfortunate plant superintendent may not have the proper equipment on his siding, his next car shift may be the next day, and the railroad may not have any of the proper type of cars within a day's run of the plant. What can be done? Nothing but wait for the cars and try to stall off the customer, who may or may not be a customer after he fails to get his shipments on time. Service to customers today is all-important. Often about all a company has to sell today is service. His competitor's price may be rock bottom and his quality of product the very best. The only way to beat him is on salesmanship and service, and the best salesman cannot make much headway if his plant repeatedly falls down on service.

Importance of Having Plant Railway Scales

Only a small percentage of rock products producing companies have their own track scales for weighing outbound railroad shipments. In a few cases where they do have such weighing equipment, the scales are frequently inspected and approved by the railroads or by weighing and inspection bureaus, and the weigh-master is paid, in part at least, by the outside agencies. The weighings then are accepted as official railroad weights. This, of course, is the ideal arrangement.

The reverse of this situation is found where a plant has no scales of its own and the nearest railroad scales are a long distance away. Sometimes there are no scales between the producing plant and the point of destination, so that the cars cannot be weighed in transit. They have to be hauled to some more or less distant point for weighing and then returned to their destination. This may cause a delay of one or even two days in making delivery. Not only is time lost but there are often other attendant losses and annoyances. Shipping documents either cannot bear the railroad weights, or if they do, they cannot be mailed out promptly but have to be held until the weights are received from the railroad.

In making bulk shipments there is always the danger of underloading or overloading cars, which is objectionable to both customers and the railroads. If a customer orders a minimum carload, say, of 30 tons, and gets only 25 tons, he (or the shipper) must pay the freight rate on the full 30 tons, and in addition 25 tons of material may not be sufficient and he may have to get in the additional five tons by local freight. All this causes delay and annoyance. If a car is badly overloaded the railroad may cut it out of a train and transfer part of the shipment to another car—again a delay, if nothing worse.

It may seem like an easy thing to estimate the weight of bulk shipments by volume measurements but even large producers, who ship thousands of carloads a year, very often overload or underload their cars. Complaints from this source are very numerous.

While it is not suggested that every shipper have his own track scales, nor that a plant site be rejected because no railroad scales are located near by, yet this factor should not be overlooked in considering shipping service to the trade.

5. *SINGLE LINE VS. SEVERAL LINE HAUL*—The routing of shipments has already been touched on in Items 2 and 3 above, but there are a few other points which are worth noting. In making freight rates, a haul over a single railroad almost always produces the lowest rate. Where the haul is over two or more roads, the rate must be high enough so that each road will get as its share enough to make the business attractive. Supposing a plant is located on the E. F. and G. railroad, which connects with the K. L. and M. railroad a few miles from the plant. The most important markets for the plant's output are in a large city on the K. L. and M. railroad, not served by the E. F. and G. The latter road has to do all the switching and plant service work, yet it gets only a few miles of haul from which it may derive revenue. If a competitive plant is located close by on the main line of the K. L. and M., it, of course, has a single-line haul to principal markets. Other things being equal, the competitive plant will and should have a lower freight rate. The E. F. and G. road will justly demand a larger share of the rate than the K. L. and M. will agree to, unless a higher rate be used.

As noted before, a two or more line haul often means slowing up of service. Cars must be cut out of a train at the junction points, held over until the next freight train is made up for the point of destination, and then switched into that train.

Other things being equal, a plant site served directly by two or more competing roads, each offering a single-line haul to many important markets, is a most desirable location.

(*To be continued*)

Cement Markets of Chile

THE CHILEAN MARKET for American cement is limited entirely to white and certain special types. The present policy of the government to protect home industry has resulted in a recent increase in duty which makes importation from the United States next to impossible, and from Europe very difficult. Prior to this increase, competition was possible in the north and the extreme south of the country. This duty became effective December 20, 1930, and from a strictly price basis it would appear that the ultimate effect will be pronounced. Prior to this decree considerable grey cement was imported from Europe, but little or none from the United States. Hence, prospects for business of this type are nil, the U. S. Bureau of Foreign and Domestic Commerce reports in Special Circular 16.

The local cement plant produces portland, quicksetting and waterproofing cements. In the past, production has been entirely portland, but during 1930, it has shifted noticeably to a greater proportion of the quicksetting. At present the output is probably two-thirds portland, with quicksetting second in volume. The trend is toward greater output of the latter.

Opinions differ concerning the quality of the domestic product, but local producers claim that it is equal to the imported product. Importers disagree. Consensus of opinion is that the local cement is probably 15% less efficient than that coming from the United States and the better brands coming from Europe.

Sales prices of Chilean cement are according to the distance from La Calera, the production center.

The attitude of consumers toward American cement is favorable; the determining factor is entirely one of price. It should be added that the good brands of European cement also enjoy a good reputation. Any preference that may be had for the American product, other than white, is more than offset by the price differential.

Improvements in Lime and Stone Production Facilities of Ohio District

The Kelley Island Lime and Transport Co. at White Rock, Ohio, Has New Modern Limestone Screening Plant and Improved Lime Hydrating Plant

THE NEW LIMESTONE SCREENING plant recently put into operation by the Kelley Island Lime and Transport Co. at its White Rock, Ohio, plant, about 13 miles southeast of Toledo, is outstanding in a number of ways. It was built to permit a better sizing and screening of the crushed limestone, particularly the smaller sizes, and is known as the fine screening plant.

The Kelley Island Lime and Transport Co. is one of the foremost producers of lime and limestone in the country, with lime and crushed stone plants at Lakeside, Marblehead, Gibsonburg, Tiffin and White Rock (Clay Center), Ohio, and Huntington, Ind., lime plants at Buffalo and and Dover Plains, N. Y., a large crushing plant at Rockport, near Alpena, Mich., and at Kelley Island, Ohio, a quarry producing open-hearth flux at Martinsburg, W. Va., as well as its sand operations at Sandusky, Lorain and Ashtabula, Ohio, Erie, Penn., and Buffalo, N. Y.

It is also one of the oldest of the present producing companies.

The White Rock plant was purchased in 1905 from the Toledo White Lime Co., which had begun the manufacture of finishing hydrate several years before, so that the well-known "Tiger Brand" finishing hydrate has been on the market for practically 30 years.

The limestone deposit at White Rock is almost a pure dolomite, with only a small percentage of impurities, and is particularly adapted to the manufacture of finishing hydrate and for fluxing and chemical uses.

The company has 260 acres of stone land at this plant, of which some 55 acres have been quarried down to a depth of 40 ft., while a second 40-ft. bench is also being worked below that.

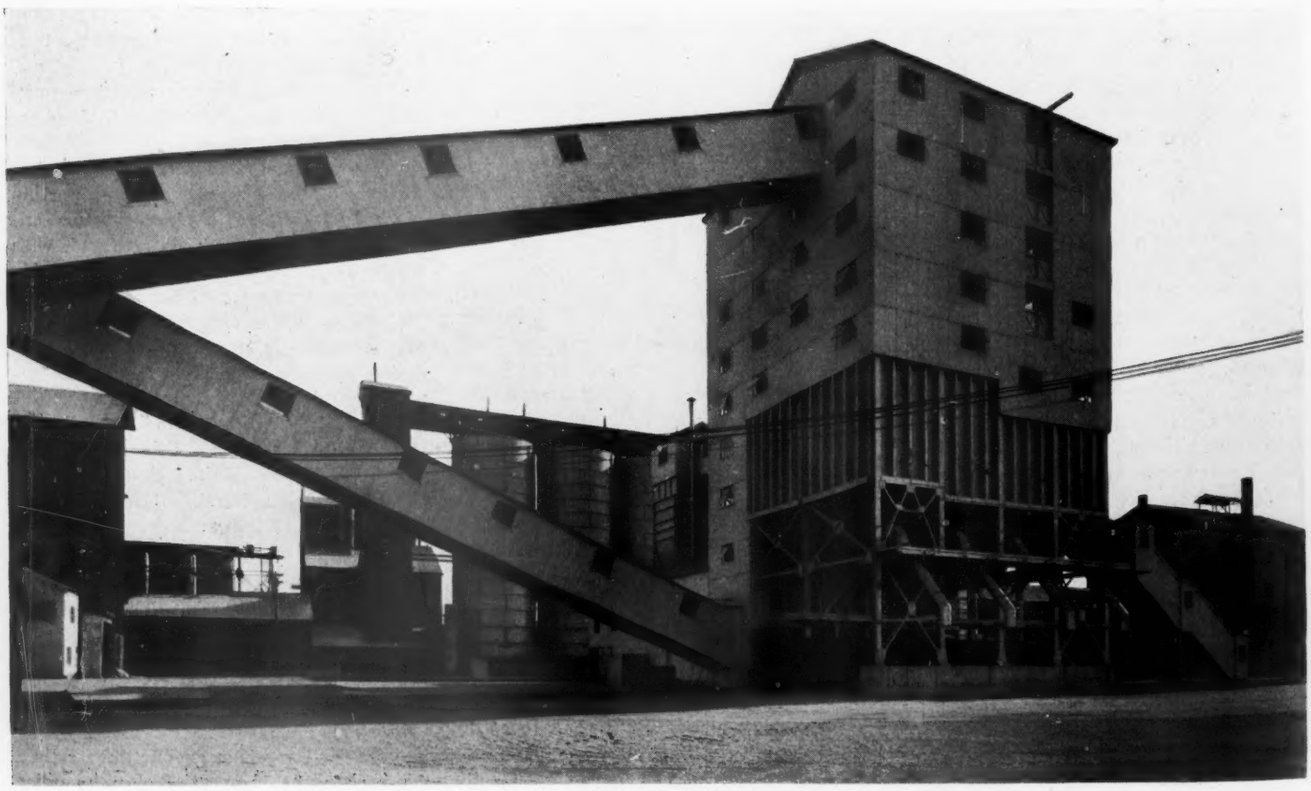
A considerable part of the stone quarried is burned into lime and hydrated, while some is shipped to steel plants for fluxing and refractory purposes, to glass plants, and for ordinary commercial uses. The lime is burned in four vertical kiln plants aggregating 53 vertical kilns, and one rotary kiln plant, with a total production capacity of 600 tons of lime per day.

The stone is quarried in the usual way and loaded by steam shovels to side-dump cars which are hoisted on an inclined track to the primary crusher. The primary crushing is done in a set of Edison rolls and the stone is then elevated and sized in revolving screens into kiln stone, ranging from 5 to 12 in. in size (for the vertical kilns); fluxing stone, 2½ to 5 in. in size; and minus 2½-in. material for the fine screening plant. The fluxing stone can be recrushed to the smaller sizes. This main crushing plant has a capacity of 250 tons per hour.

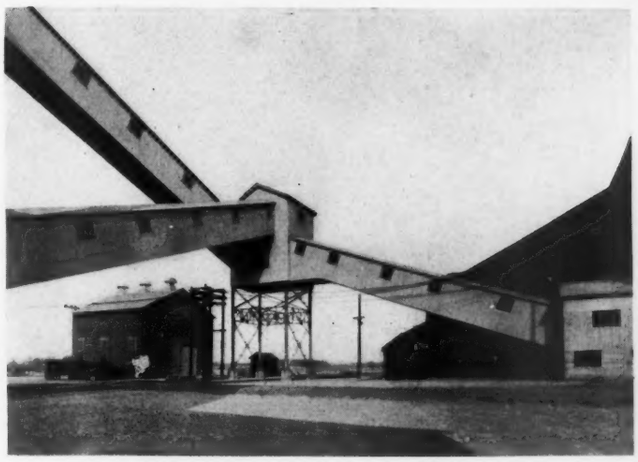
The fine screening plant was built adjoining the rotary kiln plant, to which it delivers raw material, and in connection with the rotary dryer.

Fine Screening Plant

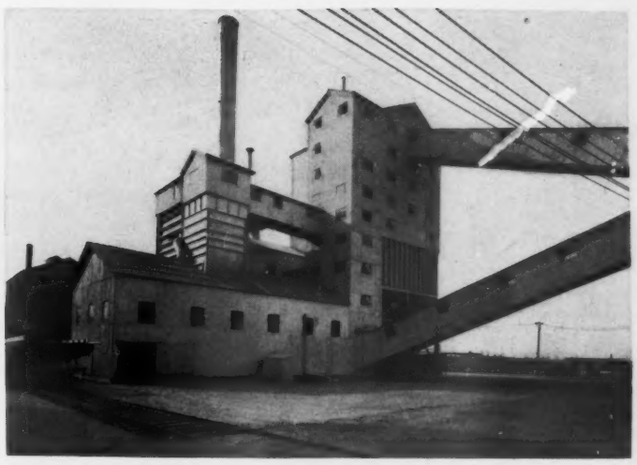
One is impressed first of all by the careful design, the thoroughness with which all details have been worked out, and by the excellent workmanship in evidence throughout the whole plant. Everything has been planned so that all equipment is readily accessible, with



General view of fine screening plant with lime plant beyond



Junction gallery of three main conveyors



Rear view of fine screening plant

plenty of headroom on all floors and with all moving machinery adequately guarded.

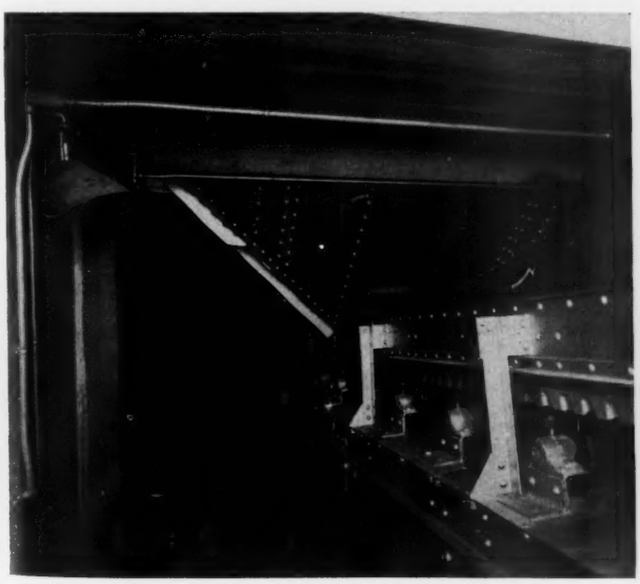
The plant is of steel construction throughout, with steel floor plates and stair treads, and a very complete and carefully worked out system of pipe hand railing. Aluminum paint has been used both outside and inside the building and on most of the equipment, with pleasing results. Each unit has been plainly marked in black as to name and number. Neatness and cleanliness are the order throughout.

All drives from the motors to the individual units are either enclosed speed reducers or V-belt drives. The motors are operated through a central control board and are interconnected so that stoppage of any unit will automatically stop all units feeding to it. Anti-friction bearings are used throughout except on elevator boot shafts and the slow-moving pan conveyor feeders.

The plant was designed by J. J. Schedel, engineer for the company, and was erected under his supervision.

The screen house proper is above the load-

Screen No. 1 and at right, house containing screen No. 4



Reclaiming conveyor and track hopper

Variable speed manganese feeder for raw material

Two views in conveyor galleries; main conveyor No. 2 at left

ing bins and is 36 ft. wide by 48 ft. long and 91½ ft. high from the ground to the lower chord of the roof trusses. Below are eight bins extending over two railroad loading tracks. Four of these are used for the larger sizes of stone and have a capacity of 150 tons each. The other four, which are used for the fine sizes, have a total storage capacity of 880 tons.

These are all hopper bottom bins and are self-cleaning. Each has a double quadrant discharge gate for railroad car loading which is operated by means of levers from a platform above the cars. Flexible spouts permit loading the fine sizes to box cars, and other spouts extend out from the building so that trucks may be loaded with commercial stone on the outside of the building.

The general arrangement is such that eight sizes can be made, and the spouts below the screens are planned to give maximum flexibility in this respect.

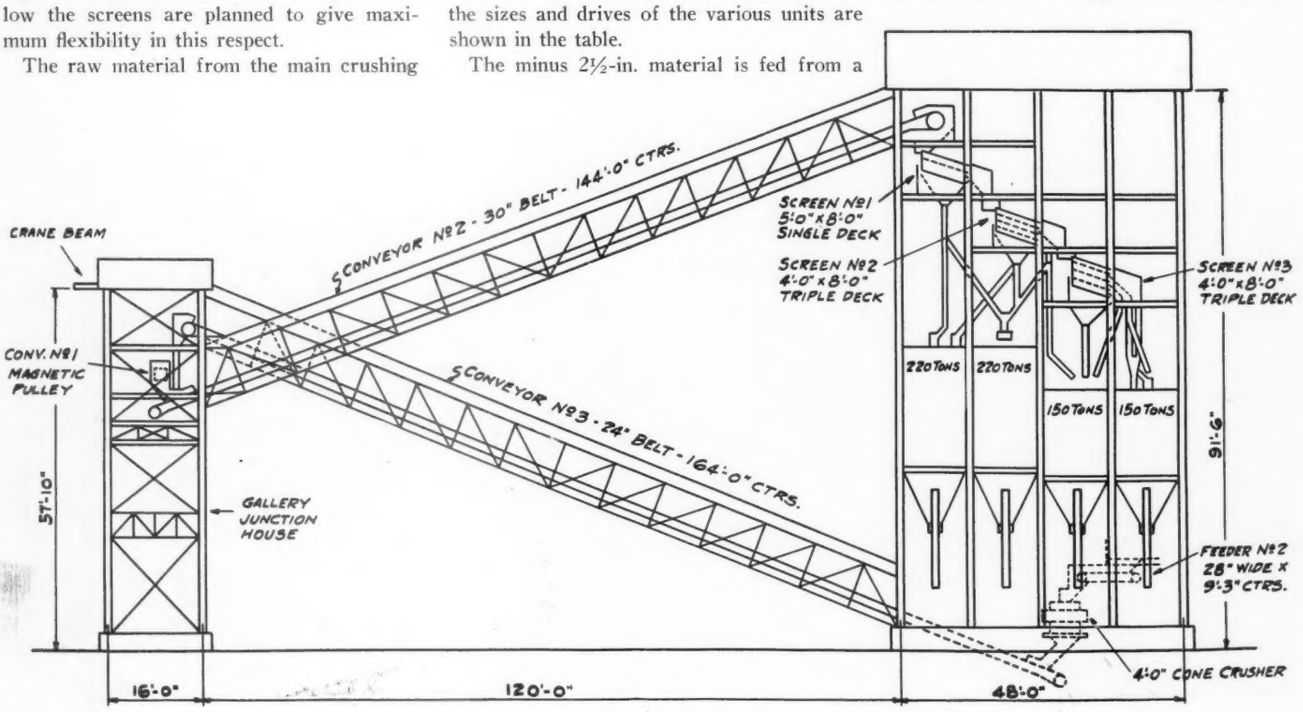
The raw material from the main crushing plant is carried by belt conveyor to the top of the screen house and put over three vibrating screens arranged in tandem. A fourth vibrating screen is used on the dried fine material. Minus ⅜-in. sizes can be put through a rotary dryer operated in connection with the plant. Plus ⅜-in. material can be put through a cone crusher for reduction to minus ⅜-in. size and returned to the screens. Special care is taken with the fine sizes so that close separation is obtained on the dried material. The fines are shipped to glass plants, the intermediate sizes to steel plants for refractory purposes, and the larger sizes are marketed as commercial stone.

Flow of Material Through Plant

The general arrangement of the plant and the flow of the material through it is indicated on the accompanying layouts, while the sizes and drives of the various units are shown in the table.

The minus 2½-in. material is fed from a bin at the main crushing plant to the first of two inclined belt conveyors leading up to the top of the screen house. Feeder No. 1 discharges to conveyor No. 1 and that in turn to conveyor No. 2, which is at right angles to it. At this junction point the return conveyor, No. 3, from the recrusher discharges to conveyor No. 2. Also at this point conveyor No. 1 is provided with a 30-in. Dings magnetic pulley for the removal of any tramp iron.

At the top of the screen house the material is discharged from conveyor No. 2 to screen No. 1, which is single deck and is equipped with 4-mesh wire cloth for the removal of fines. From this screen the material is spouted to screen No. 2 on the floor below and from there to screen No. 3 on the next lower floor. These are both triple deck screens and are equipped with 1-in., ½-in.



Front elevation of fine screening plant and conveyors

and 4-mesh wire cloth. The spouting between and below the screens is arranged with gates and these in connection with changes of screen sections permit the making of material of any required size.

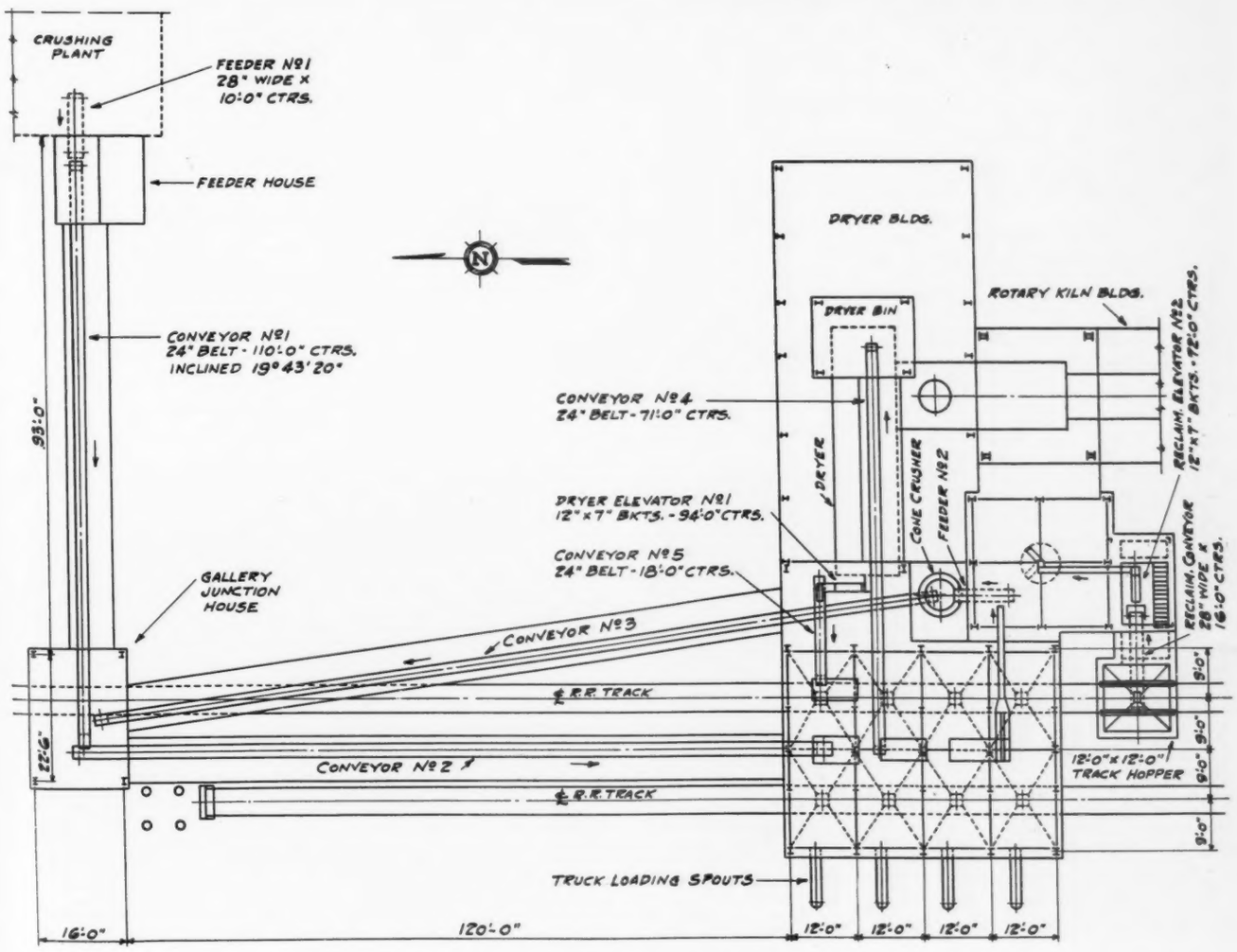
The spouts from the screens to the bins are provided with inspection and sampling openings conveniently located just above the bin tops and with lights inside and below to show the conditions in the bins. The bin tops over the fine sizes are dust-tight, as are also the covers of the inspection openings.

In order to obtain under all conditions a proper separation of the smaller sizes they are put through a rotary dryer and then sized over a fourth screen. Such sizes up to ⅜ in. as are to be dried are drawn from the first two screens and spouted to conveyor No. 4, which discharges to a bin at the dryer. The dried material is then carried up by elevator No. 1 to a short enclosed belt conveyor (No. 5) which discharges to screen No. 4. This is a triple deck vibrating screen enclosed in a dust-tight house and equipped at present with 10-, 20- and 80-mesh wire cloth.

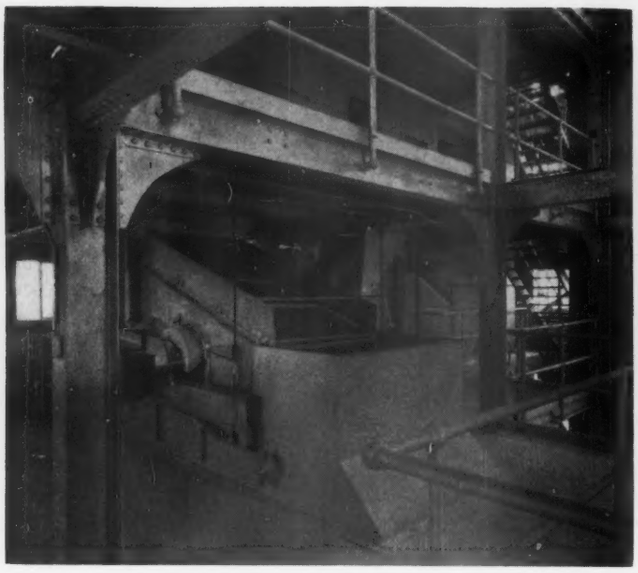
Recrushing

Recrushing is done in a 4-ft. Symons cone crusher. This is a new type short head

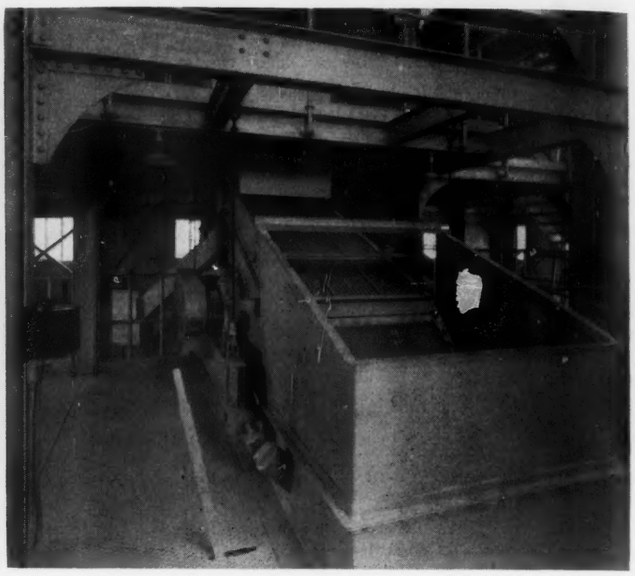
End view of loading bins, showing operating platforms and tracks



Plan of screening plant and conveyors



Vibrating screen No. 2



Vibrating screen No. 3

crusher and is understood to be the first installation of its kind in the crushed stone industry. It is driven through a V-belt drive by a 150-hp. synchronous motor which is designed to operate at 40% leading power factor. This unit is run continuously, even when not recrushing, in order to improve the power factor of the whole plant.

Head of main conveyor at top of screen house

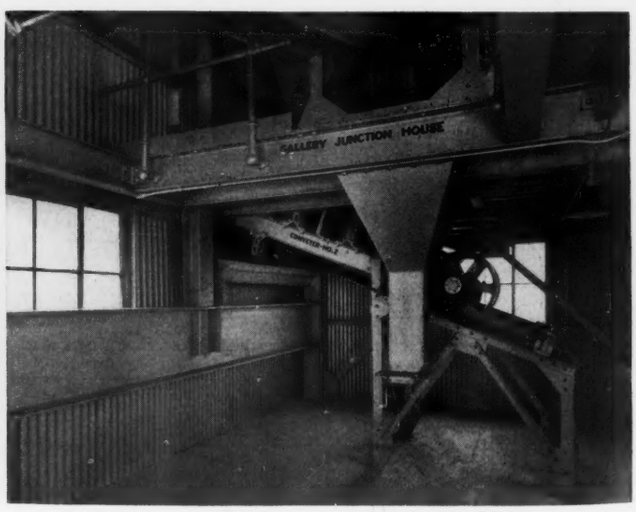
The material to be recrushed is fed to the crusher by a short pan conveyor type feeder (No. 2) and the crushed material is returned to the main stream on conveyor No. 3.

Both feeders are of manganese and each is driven by a 3-hp. motor through a variable speed reducer and a gear reducer, so that the feed may be easily adjusted to suit the conditions.

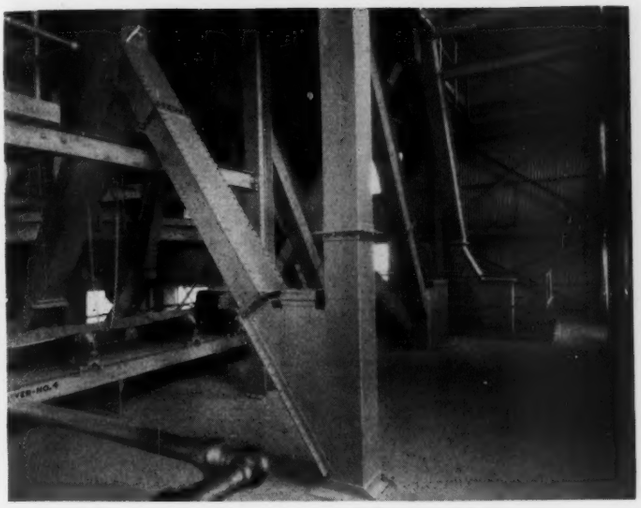
Reclaiming Equipment

At one end of the plant is a 12-ft. by 12-ft. track hopper with a grating of 4-in. square openings through which stone may be reclaimed from storage to the plant. Below the track hopper an inclined manganese pan conveyor feeder of the type already described carries the material to an elevator. This elevator, as well as the one at the dryer, are

Junction point of conveyors No. 1, 2 and 3



Discharge point of conveyor No. 1 to conveyor No. 2



View both ways at top of bins, showing conveyor No. 4 and inspection openings in chutes

both of the same type and construction, with a 19-in. by 60-in. dust-tight steel casing and 12-in. by 7-in. malleable iron buckets.

The elevator discharges to a chute connected with a manganese turnhead so that the material can be put into any one of four bins. This turnhead is operated by chain and sprockets from the walkway above one side of the bins. From one of these bins the material can be fed to the cone crusher.

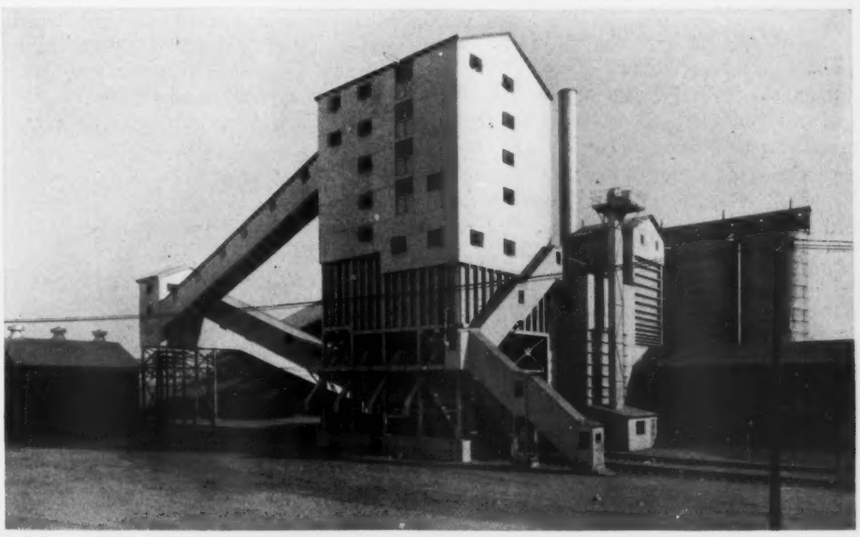
Electrical Installation

The electrical installation is especially complete and well done. The control board on the upper floor is the desk type with push buttons and indicating lights for each unit, and is located so that most of the screen house equipment is in view.

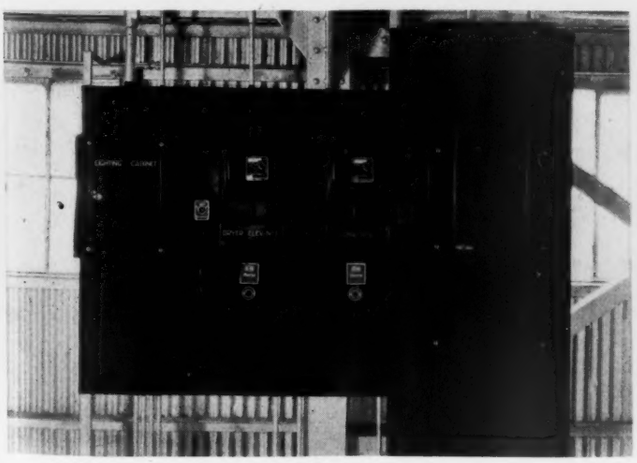
Cutler-Hammer magnetic starters are used and Bulldog Electric Products Co. cabinets and safety switches. The cabinets are built so that the fuse block, which is fitted with blade contacts, must be pulled out in order to replace fuses. In the same way the switches in the lighting cabinet must be in the off position before the fuse plug can be removed and replaced.

An interesting feature is that the demand meter in the substation is connected with the motor driving the feeder at the cone crusher, so that if the power being used by all the plants becomes excessive the feeder is automatically stopped. Also a horn is sounded in the main crushing plant as a signal to stop dumping stone to the rolls until the peak has passed.

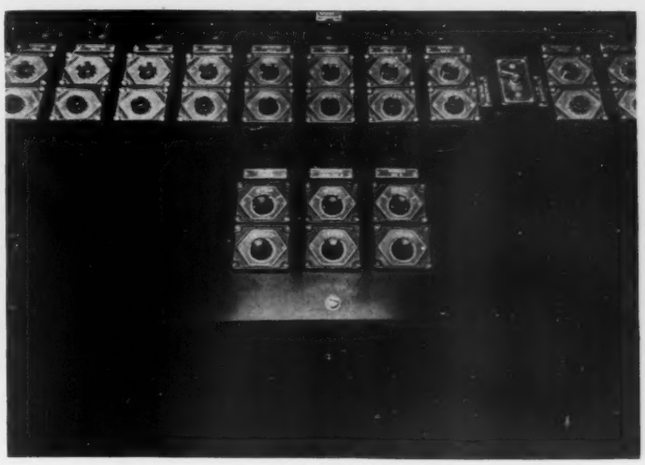
The power factor of the plants as a whole



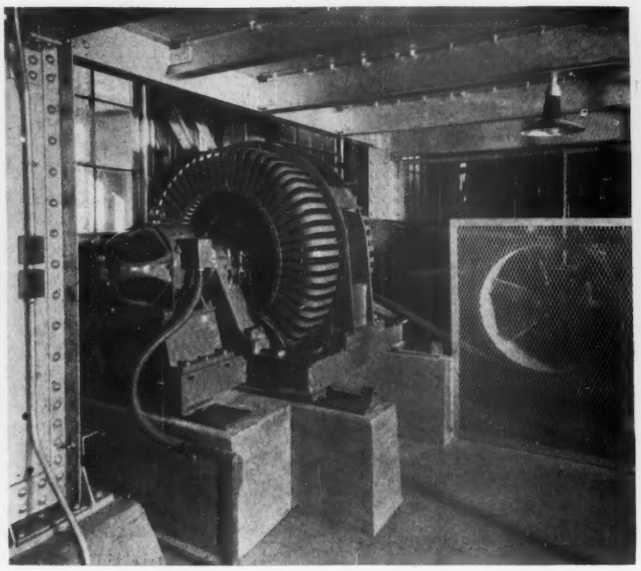
Another view of the fine screening plant



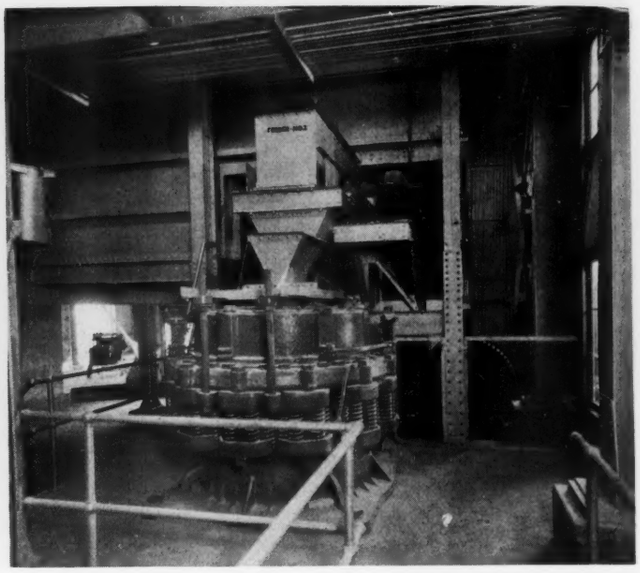
Arrangements of cabinets and starters



Push-button control board with indicating lights



Synchronous motor and drive to cone crusher



Cone crusher with feeder above and driving motor beyond

has been considerably improved up to 92% as a result of operating the synchronous motor on the cone crusher continuously.

Miscellaneous Equipment

The conveyor idlers are all double ball bearing, and roller bearings are used on the head and foot shafts. Special belt cleaning brushes are used on conveyors Nos. 1, 2 and 3, consisting of rubber strips fastened to a pulley and driven by roller chain from the head shafts.

The conveying equipment, vibrating screens and chutes were furnished by the Stephens-Adamson Manufacturing Co.

Falk herringbone gear reducers of the right angle drive type are used on all drives other than V-belt, and Falk flexible couplings in connection with the reducers. Dayton cog-belt drives are used on the vibrating screens.

Diamond roller chain is used on all chain drives, including the conveyor brushes, the reclaiming feeder and conveyor No. 5.

The hoppers and chutes at the ends of the screens are protected by Taylor-Wharton manganese steel plates, and the discharge plates at the same points are covered with Goodyear "Armorite" rubber lining.

Cop-R-Loy and Toncan corrugated galvanized iron was used for the covering of the building.

Hydrating Plant Changes

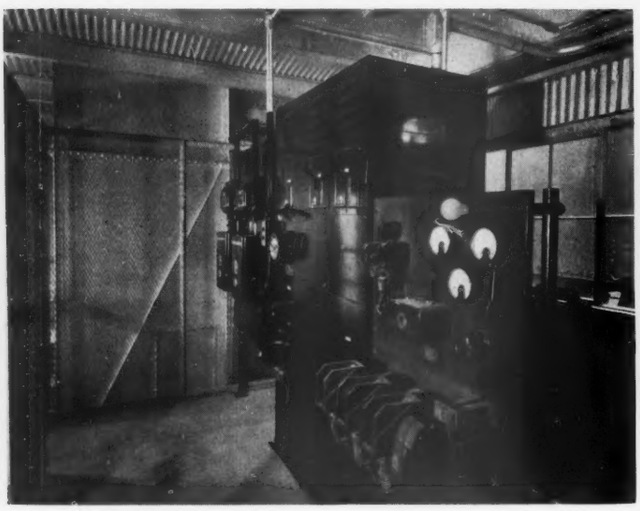
The hydrating plant, known as Plant B, a part of one of the four vertical kiln units, has been considerably remodeled and thoroughly modernized within the past year. The drives were rearranged so that all units are driven by individual motors with enclosed gear reducers and protected roller chain drives. All bins and spouts were made dust-tight, so that the plant is unusually clean, as indicated in the accompanying photographs.

In addition to these improvements three large silos were added for the storage of hydrate. By means of screw conveyors and a bucket elevator the hydrate can be put into these storage silos and later reclaimed by another screw conveyor in a tunnel below. These changes and additions were completed in February, 1931.

The silos are each 30 ft. in diameter by 80 ft. high, with a capacity of about 1000 tons of hydrate each. They are of steel plate construction, with a steel gallery above and an elevator shaft at one end. The concrete tunnel below is roomy and well lighted.

The bottom of each silo is arranged with three hoppers in line, and each is equipped with a Raymond rotary feeder to regulate the flow of material to the reclaiming screw conveyor

The handling of the material through this plant is briefly as follows: Lump lime from the kiln shed floor is carried by a pan con-



Control panels for synchronous motor

General view of synchronous motor installation

Two views in gallery above storage silos at hydrating plant

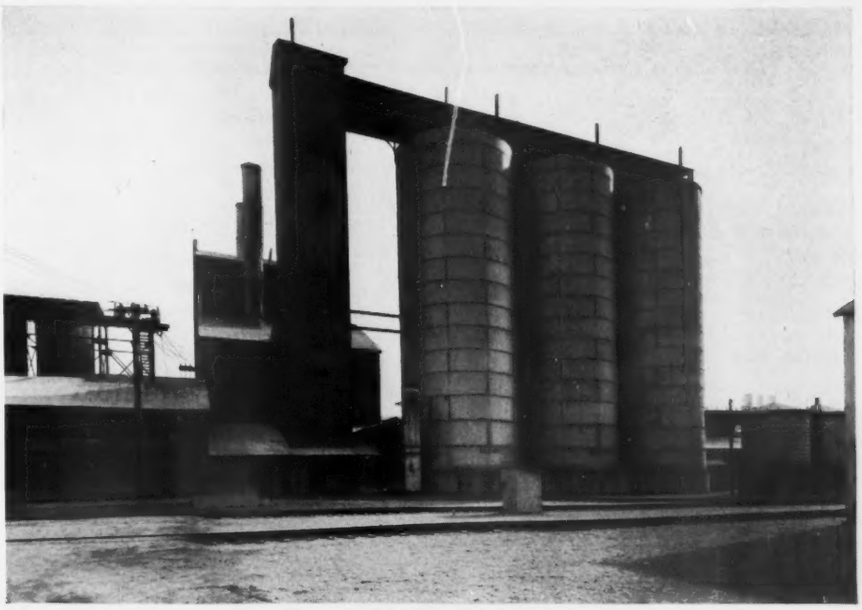
veyor below the floor to a hammer mill and the crushed lime elevated to a bin over two Clyde hydrators. The hydrated lime is then carried by screw conveyors and elevators to bins and to two Fuller Lehigh ball mill pulverizers, and after being finished in these mills is elevated to bins above two 4-tube Bates packers. The bagged material is either loaded direct to cars or stored in a warehouse which has a capacity of about 1000 tons of hydrated lime.

In making these additions and changes the same principles were followed as in the design of the fine screening plant already mentioned.

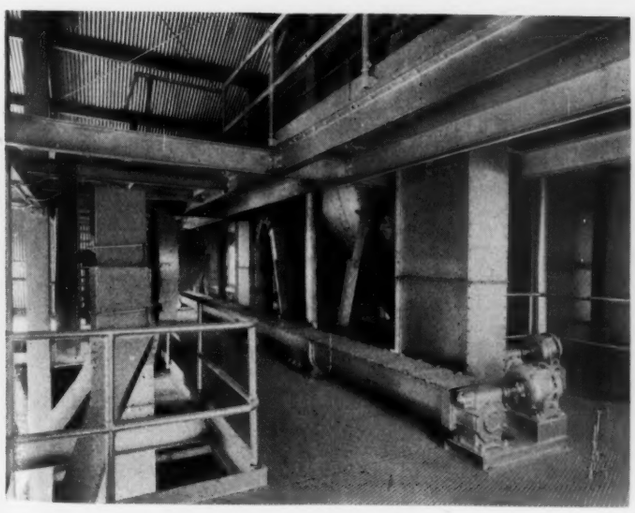
All motors are push button operated and electrically interlocked, except those driving the ball mills. Caldwell gear reducers were used, with Allis-Chalmers motors. Stephens-Adamson Manufacturing Co. and Cutler-Hammer equipment was also used.

Aluminum paint was used in the same way as at the other plant and each unit named and numbered in legible black letters.

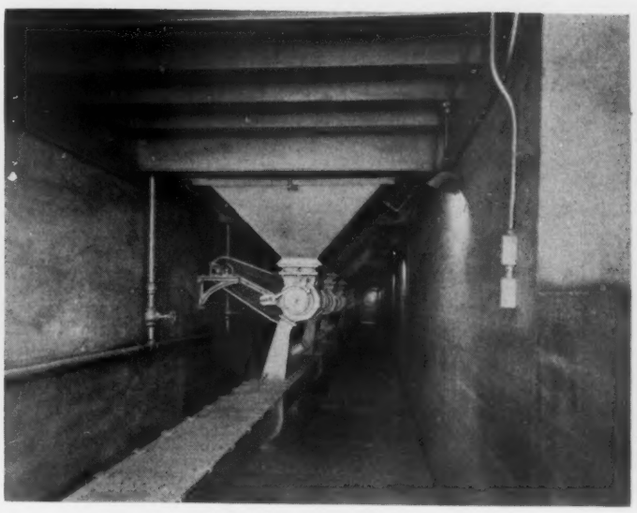
The plant was designed by Mr. Schedel and rebuilt under his supervision. All ma-



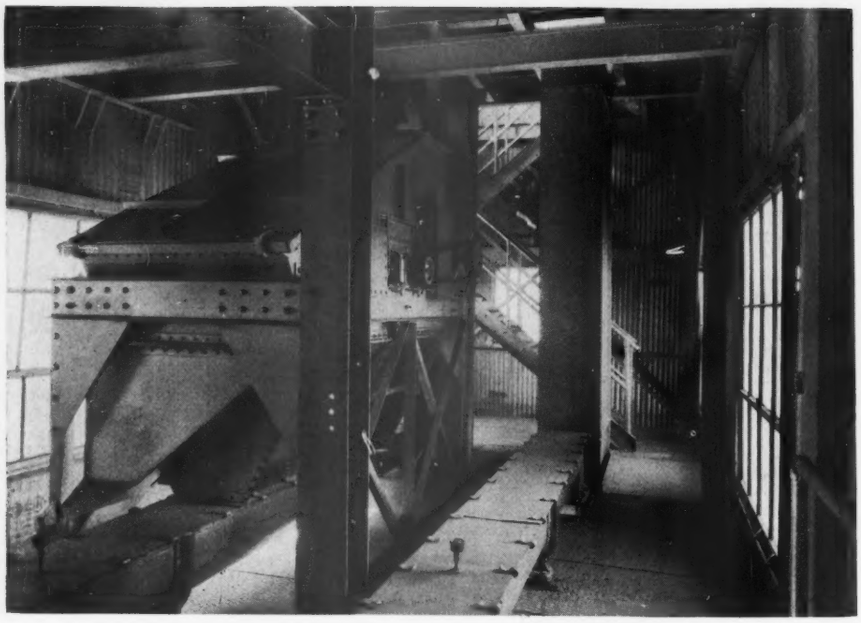
General view of lime hydrating plant



Conveying and elevating equipment in hydrating plant



The reclaiming tunnel below the silos



Enclosed vibrating screen over which reclaimed hydrate is passed

TABLE OF EQUIPMENT IN FINE SCREENING PLANT

Unit	Where Used	Size	Drive	Motor HP.
Feeder No. 1	Raw material	28-in. by 10-ft.	J.F.S. and Falk reducers	3-hp. West.
Conveyor No. 1	Raw material	24-in. by 110-ft.	Falk reducer	7½-hp. West.
Magnetic pulley	Raw material	30-in. diam., 2-kw.		2½-kw. M.G. set
Conveyor No. 2	Raw material	30-in. by 144-ft.	Falk reducer	15-hp. West.
Screen No. 1	Raw material	5x8-ft., single deck	Dayton cog-belt	7½-hp. G.E.
Screen No. 2	Raw material	4x8-ft., triple deck	Dayton cog-belt	7½-hp. G.E.
Screen No. 3	Raw material	4x8-ft., triple deck	Dayton cog-belt	7½-hp. G.E.
Conveyor No. 4	Raw material	24-in. by 71-ft.	Falk reducer	5-hp. West.
Elevator No. 1	Dried material	94 ft. long, 12-in. buckets	Falk reducer	7½-hp. West.
Conveyor No. 5	Dried material	24-in. by 18-ft.	Falk reducer and chain	From Elev. No. 1
Screen No. 4	Dried material	4x8-ft., triple deck	Dayton cog-belt	7½-hp. G.E.
Feeder No. 2	Recrushing	28-in. by 9¼-ft.	J.F.S. and Falk reducers	3-hp. West.
Cone crusher	Recrushing	4-ft. short head	Texrope	150-hp. West.
Conveyor No. 3	Recrushing	24-in. by 164-ft.	Falk reducer	7½-hp. West.
Reclaiming conveyor		28-in. by 16-ft.	Falk reducer and chain	5-hp. West.
Reclaiming elevator		72 ft. long, 12-in. buckets	Falk reducer	10-hp. West.

chinery was installed and electric wiring done by the company.

General

The general offices of the Kelley Island Lime and Transport Co. are in the Leader Building Cleveland, Ohio. G. J. Whelan is president and general manager. John E. Brunner has been superintendent of the White Rock plant since it was taken over by the company in 1905.

Consider Graphite Land Development

MINING ENGINEERS declare the molybdenum and graphite deposits in Okanogan county, Wash., can be worked cheaply and profitably, values in the ore having been accurately tested.

No announcement as to development of the property has been made, however.

"This property is situated to facilitate low working costs. The contour of the country lends itself to the extraction of several million tons of ore by quarrying and by self-drained tunnels," says W. B. Hancock, mining engineer of Seattle.

"Large areas of the rock are practically bare and at no place examined was there more than 18 in. of overburden over the minerals.

"Several samples have been tested for graphite, with an average of 7.7% which is much higher than in most paying graphite mines of the country.

"The value of the ore will be approximately $18.50 per ton and the cost of mining and treatment will not exceed $3 per ton, to which must be added transportation, depletion, renewals, interest and taxes, which will not exceed $1 per ton."—*Okanogan* (Wash.) *Independent.*

Tourmaline

TOURMALINES are among the most beautiful of all the semi-precious stones, and are unsurpassed even by corundum in variety of hue. The stones most suited to jewelry purposes are those comparatively free from iron. One reason for the fact that the tourmaline has advanced rapidly in public favor in this country is that it is found in California in great profusion and of extraordinary quality, Bureau of Mines Information Circular 6539 reports.

It also says the fact that tourmaline is soft and consequently not very durable discourages its use where it is likely to encounter hard wear.

It is used in the manufacture of tourmaline tongs and in measuring the intensity of radium emanations, in addition to its use in jewelry.

Tourmaline occurs in compact or disseminated masses in rock and as loose, rounded crystals in secondary deposits. It is a common accessory mineral in pegmatites associated with granite intrusions, and also in metamorphic rocks. The light-colored gem varieties are found chiefly in pegmatites. The minerals ordinarily found associated with tourmaline are orthoclase, albite, quartz, muscovite, lepidolite, beryl, apatite, fluorite, etc.

Generally, in mining for tourmalines, the rock is drilled by hand and the blasting is done with black powder in preference to dynamite, so as to minimize the risk of shattering the valuable gem material. Where a considerable thickness of schist overlies the pocket-bearing layer, tunneling is the most economical method of working. After the rock is broken, the tourmaline crystals are removed carefully by hand.

In the United States, California and Maine have been the chief tourmaline producing states. These widely separated regions are both famous for their beautiful colored tourmalines.

Other localities in this country are Haddam, Conn.; Chesterfield and Goshen, Mass.; Gouverneur, De Kalb and Pierrepont, N. Y.; and Chester, Penn. Deposits of lesser importance have been found also in several other states.

Directory of British Quarries and Nonmetallic Producers

A 1931 DIRECTORY of quarries, sand and gravel pits, brick works and miscellaneous nonmetallic and clay operations has been published by the Quarry Managers' Journal Ltd., 53 Broad St., Birmingham, England.

The directory gives first an alphabetical list of producers, then a geographical list by counties and finally a list of quarries only classified according to their main products.

In addition various tables are given.

Keene's Cement: Its Use and Manufacture

By John C. Best
President, The Best Bros. Keene's Cement Co., Medicine Lodge, Kan.

THERE IS an essential difference between Keene's cement and practically all other forms of plastering materials which are produced from gypsum. In the manufacture of plaster, approximately three-fourths of the water of combination in the gypsum is driven off by calcination at a comparatively low temperature. This calcination is generally accomplished in kettles, although rotary kilns are used in a few plants, and changes the material from the di-hydrate to the semi-hydrate.

In the manufacture of Keene's cement, all the water of combination is driven from the gypsum, leaving it completely dehydrated. The result is a material too slow setting for commercial use as compared to the rather rapid set of the semi-hydrate. The setting time of ordinary plaster is therefore usually controlled through the addition of retarders, while the setting time of Keene's cement is controlled through the use of materials that act substantially as accelerators.

Characteristics of Keene's Cement

Keene's cement has several characteristics that distinguish it from ordinary plaster. In the first place it will keep indefinitely. We have known of cases where the material has been used with complete success after being stored for 10 or 12 years in a relatively humid atmosphere, and have no reason to doubt that the same results would have followed after twice the length of storage.

The second characteristic of Keene's cement is that it can be retempered. If it is broken down and remixed with water after it has taken its initial set, it will set up hard and strong again. This is a simple field test for Keene's cement, as other forms of plaster made from gypsum cannot be retempered.

The third charateristic of Keene's cement is a high compressive and tensile strength.

In its manufacture the gypsum rock should be as pure as possible. In certain grades, particularly those intended for use in the manufacture of artificial marble, even 1% of certain impurities will often have a detrimental effect on the finished work. The impurity most commonly found in gypsum is of course calcium carbonate. Many of the catalysts that can be used to the best advantage in Keene's cement will react with this carbonate in the rock, and the temperature at which Keene's cement is calcined will also result in the liberation of a portion of this carbonate and the resulting presence in the finished product of a trace of free lime. To the best of our knowledge there are only two deposits of gypsum rock in the United States east of the Rocky mountains sufficiently pure for the successful production of Keene's cement on a commercial scale.

Editors' Note

IN this article are outlined the differences between Keene's cement and other gypsum plasters, its characteristics and the manufacturing process.

A description of such troubles as are sometimes encountered in using Keene's cement, how to identify any such troubles and how they may be avoided is also given.

—The Editors.

Manufacture

In the manufacture of Best Bros. Keene's cement the rock is carefully graded in the mines before being loaded into cars. The crushing plant is located just outside the entrance to the mines and at this point the rock is again graded for color, then crushed, screened, sized and stored in steel bins. From these bins it is loaded directly into railroad cars and the cars carefully covered with canvas to keep out all cinders and other impurities.

On arrival at the mills the cars are unloaded through a track hopper and stored in dust tight bins holding 1000 tons each. From the bins the rock is handled by Hardinge constant weight feeders to the 8 ft. by 125 ft. rotary kilns, of which there are three in the plant. In this way a uniform rate of feed is assured. The same uniformity covers all other features of the calcination, which is done with natural gas as a fuel. The various pressure and draft gages and recording pyrometers are all installed in a control room where the slightest fluctuation is at once evident to the burner.

The grinding is done either in burr mills or Raymond mills, depending upon the degree of fineness desired. The chemical formula is checked at short intervals by the laboratory and samples are retained of every shipment leaving the mills. As the plant has total storage facilities for 4000 tons of raw rock, 1000 to 1500 tons of material in process of manufacture and nearly 4000 tons of finished product, every facility is offered for carefully checking the material before shipment and full advantage is taken of this.

How to Avoid Complaints

A certain amount of trouble is experienced at times in the use of all materials that do not represent a finished product as shipped, but have to undergo further manipulation and application under varying conditions. In the occasional instances where trouble is reported with Keene's cement plastering, the cause can usually be readily determined.

There is a small group of cases, very infrequent and always difficult to solve, where the trouble can be traced to the chemical action of impurities present in the water, sand or base. Leaving this group out of consideration, complaints can generally be traced to one of five causes.

1. *Dry-Outs.* While no accurate record has been kept, probably 70% of all complaints prove to be due to dry-outs. Occasionally these are dry-outs due to the plastering being unprotected during hot, windy weather, but a more common cause is that the brown coat was entirely too dry when the Keene's cement finish was applied. As already pointed out, Keene's cement is a somewhat slower setting material than ordinary plaster. It therefore requires a little more time in which to set and harden and must retain its moisture during this process. Theoretically any plastering material made from gypsum should take up during the setting process the same amount of water of crystallization that was contained in the raw rock, namely, 20.9%. In actual practice a satisfactory plastering job will generally show from 16 to 19% of water of crystallization in the gypsum.

2. The next most common cause of trouble, possibly accounting for 20% of complaints, is too much lime in the mixture. Both in this class of complaints and in the first class mentioned, the result is that the Keene's cement finish does not become as strong as it should, and the only way to tell whether the trouble is due to a dry-out or an excess of lime is by analysis.

3. Perhaps 5% of the cases of trouble reported are due to the finish coat being applied in too stiff a mixture and troweled down too soon. It is better to put on a Keene's cement finish in two coats. The first coat should be quite thin so as to take up the suction of the brown coat and provide a good bond. The second coat can then be mixed a little stiffer and can be troweled to a smooth finish as soon as it has stiffened up sufficiently. The evidence of trouble in this case is that, while the finish coat gen-

erally sets quite hard, it has a tendency later to crack and to flake away from the wall in sheets of varying size.

4. In a small per cent. of cases the trouble is due to an imperfect mixing of the Keene's cement and lime. In other words, there will be spots throughout the finish that are practically pure Keene's cement and other spots that are almost entirely lime putty. This trouble is the easiest of all to recognize. The spots of lime putty will usually show up soft and with small shrinkage cracks through them. There will also be a difference in color between the spots where the Keene's cement predominates and those where the lime is in excess.

5. Discoloration of the finish. This is a very rare cause, probably not accounting for more than 1% of the few cases of trouble reported. It is, however, apt to be serious and extend over large areas. As there is nothing in a finish coat of Keene's cement that could of itself produce discoloration, the cause can always be looked for, and generally located, either in a job condition or the base over which the material is applied. Generally it occurs in cases where a Keene's cement finish has been applied over a brown coat on a brick, tile or concrete wall. Either the wall itself or the brown coat applied over it has not dried out when the finish is put on. The only way that this surplus moisture can escape is therefore through the plastering and, in evaporating, it brings with it, any impurities or discoloration from soluble materials present in the wall or brown coat. This is a seasonal trouble, much more likely to occur during the first few warm days in spring than at any other time, due to plastering being applied over walls that have been erected during the cold weather and have not had an opportunity to dry out.

It is much easier to avoid trouble in plastering than it is to correct it after it has occurred. In listing the above complaints or troubles, based on an experience of 40 years with the material, ways of avoiding the trouble are given. Due to the care used in the manufacture of the material and the laboratory control these troubles are comparatively rare if the material is properly applied.

New Faster Setting Cement

About the only objection of any moment that has been advanced against using Keene's cement by plasterers has been that it is slower setting than ordinary plaster and cannot be trowelled down until several hours after it has been applied. This requires more time and labor, and ties up scaffolding on a job. To overcome this objection the Best Bros. Keene's Cement Co. has developed within the past two years its "fast finish" grade of Keene's cement, which is specially designed so that, when mixed with the proper proportion of lime putty, it will set up and can be given a final trowelling in the same time as an ordinary lime putty and plaster finish. While the setting time has been thus shortened to a marked extent, the "fast finish" grade is a genuine Keene's cement passing all requirements of the A.S.T.M. It has been used with marked success on a number of buildings during the past 18 months, including the new $17,000,000 Department of Commerce building in Washington, D. C., where it was used for the finish plastering of nearly four miles of corridors.

Dust Control in Phosphate Rock Grinding

TWELVE Raymond mills with air separators are used to grind phosphate rock in the Davison chemical plant at Baltimore, Md. According to an article by W. H. Gabeler in *Industrial and Engineering Chemistry,* two faults appeared when the installation was made. The first was the irregular load curve on the mill motor (which was corrected by providing mill feed control from a pick-up actuated by a solenoid in the mill motor line) the second was the dust discharge from the collecting cyclones.

This vent air, amounting to about 1000 cu. ft. per min. per mill, carried the extreme fines from the grinding operation and made a serious dust nuisance as well as an appreciable loss of material. To remedy this, the first and simplest method tried was to close off the vent and run the air separation system with no excess air. The most serious objection that developed from this course was the accumulation of the moisture which came from the ground material. The air became saturated, the moisture condensed and then the ground material built up and clogged in the pipes and other parts of the apparatus. A table in the article shows the decreased efficiency with the air vent closed. The rock ground fell from 4.07 to 3.13 tons per hour, and the load on the fan motor was raised from 30 to 32.4 amp.

This proved the necessity of some venting, and it was next tried to remove the dust in the vent air. A water spray in a horizontal pipe was installed but it did not precipitate any appreciable amount of material. Water sprays were tried in connection with the centrifugal separation, but they affected little improvement in the volume of dust discharged.

It was apparent from this that some high-efficiency collection method must be installed and Dracco filters with cotton-napped filter bags were chosen. These might have been put in as one unit for all cyclone vents, but it was decided to erect a two-compartment filter for each set of two vents. This had the advantage of approaching unit operations of each mill. A small test plant was purchased and operated before the complete plant installation was built.

The recovery amounts to a little less than a ton a day of exceedingly fine material. The material caught in the mill cyclones is itself so fine that more than one-half will pass 200-mesh. Of the filter material, 3.5% was retained on 200-mesh and about 84% passed 300-mesh. The average of these particles is well under 2 microns, and much of it is smoke fine. This fineness explains why the mechanical and spray collectors were not successful in collecting much of the material.

The article gives as the advantages of the installation that: "That serious dust nuisance has been eliminated completely, which has both improved the appearance of the plant and increased the goodwill of the surrounding district. In addition, the 0.2% recovery of the product formerly lost has increased the over-all efficiency of the plant."

Separating Cyanite and Mica from Quartz

AN EXAMPLE of how commercial products may be obtained from certain fairly complex mineral combinations is given in U. S. Bureau of Mines Report of Investigations No. 3085. The work was done under cooperative agreement between the Bureau of Mines and the University of Utah. The authors of the paper are F. H. Hintze of the university and L. H. Lange of the bureau.

The rock tested contained cyanite and mica in combination with quartz, and mica in schist. The paper says it was fortunate that the usual associates of cyanite in schist, garnet, magnetite and tourmaline, were not present, as they might have interfered in the simple separation processes used. It had been planned to try electrostatic, pneumatic and flotation concentration if table concentration had not been successful.

The method of analyzing was by the use of Thoulet solution, potassium mercuric iodide, and tetrobromoethane, the latter being found the better. It has a specific gravity of 2.97 and in it the cyanite (sp. gr. 3.6) sinks while the other minerals float. One gram samples were analyzed by placing in a separatory funnel with 50 c.c. of this solution.

The paper gives the results of the various tests of table concentration. Among other things it was found that the cyanite was all freed with crushing to 20-mesh. After crushing by a small jaw crusher and rolls, 9.7% remained on 20-mesh, and this was principally mica which was tabled as a separate lot. The remainder had practically all the cyanite in the sizes minus 20- and plus 100-mesh. A Deister-Overstrom table was employed to concentrate these sizes.

The concentrate from the table was screened over a 35-mesh screen and the oversize was a concentrate of 99% cyanite. The fines from screening were then classified by water classification and this produced another concentrate of high purity, over 90% cyanite.

The mica present was obtained as a high-grade product during the tabling. It was found to separate on the table very readily.

The minus 100-mesh material contained so little cyanite that no tests were made with it, but the paper suggests that in cases where the fines contain considerable cyanite, air separation might solve the problem of recovering it commercially.

Plant Design and Practices—Part III

Details Often Neglected

By G. W. Maisak
Brooklyn, N. Y.

THE NEXT STEP in this series is the discussion of the feed of the scalping screen. The writer has observed that many operators feed their scalping screen by having a belt conveyor discharge directly into it. The stone is thrown several feet into the screen, thereby using an expensive machine as a chute. The purpose of this article is to show how an inexpensive stone box can be

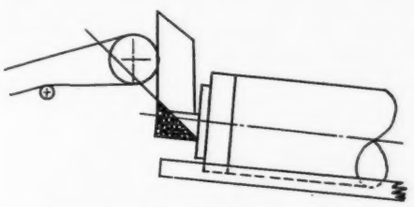


Fig. 6. Inexpensive stone box

constructed using the "stone on stone" principle.

A simple box is shown in Fig. 6. Every manufacturer of equipment provides a chute when the screen is shipped from the factory. Recent designs show that many manufacturers are providing simple sheet metal feed boxes similar to that shown in Fig. 6. A further development is the use of a shelf as shown in Fig. 7. This shelf breaks the fall of the stone and the stone rolls into the screen. This is especially desirable when the feeding conveyor is operated at fairly high speed.

When two screens are required a simple method of providing a feed arrangement is the use of the "stone on stone" principle as illustrated in Fig. 8. The shelf may be used if desired.

Many modern plants use vibrating screens or roll grizzlies as scalpers. In this case the

Editors' Note

THIS IS the third of a series of articles by Mr. Maisak on practical plant details. The other two articles were published in the February 28 and September 12 issues of this year.—The Editors.

feed problem is very important, and one that is frequently ignored. The writer has often watched stone, which should be scalped out, "slither" over the surface at high speed and mingle with the oversize. Figs. 9 and 10 show two methods by which this fault can be overcome. When the maximum size of feed does not exceed 4 in., the writer believes that Fig. 9 shows a practical feeding arrangement. The dimension *A* as in Figs. 7 and 8

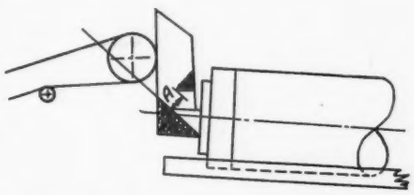


Fig. 7. Stone box with additional shelf

should be about four times the maximum size of feed. When the feed is slabby, five times maximum feed would not be too much. The dimension *C* in Fig. 9 should be at least two times the maximum feed.

In all of the figures the reader will note that the head pulley of the conveyor is located by making use of the natural angle of repose. This line, extended, passes through a point midway between the center of the pulley and the rim. This rule will be followed throughout the series. If pressed for headroom the head pulley may be lowered so that the line passes through the center, but the writer does not recommend that it be lowered any more than this under ordinary circumstances. The reason for following this

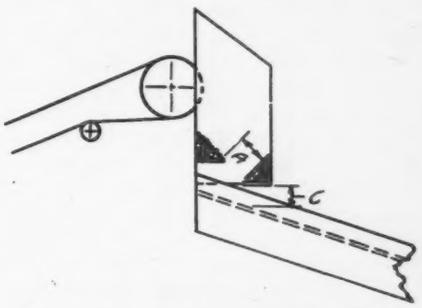


Fig. 9. Practical feeding arrangement for vibrating screen

rule is to give the discharging stone a chance to fall clear of the enclosing box and fall directly into the stone box, thereby helping to eliminate wear and tear.

Reverting back to revolving screens, many scalping screens are equipped with dust jackets for removing some of the dirt coming from the quarry. In this case it is advisable

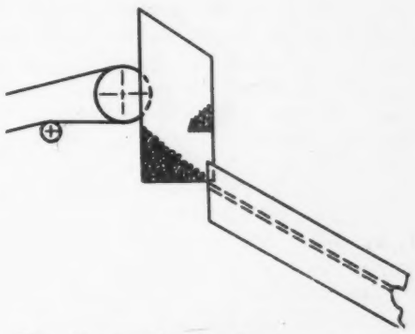


Fig. 10. Another feeding arrangement for vibrating screen

to fit the first few feet of the main body of the screen with sections having smaller holes than the rest of the screen, so as to distribute the load on the dust jacket. The reason for this is readily seen. If it is not done, the first few feet of the jacket will receive most of the load and is liable to block up, especially when there is considerable dirt to be removed.

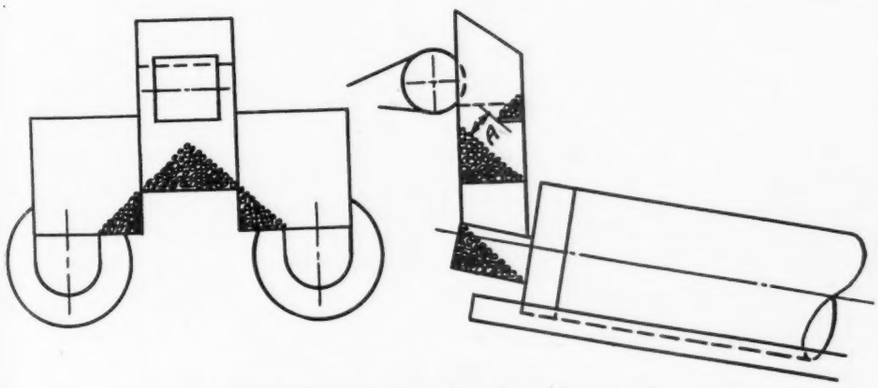
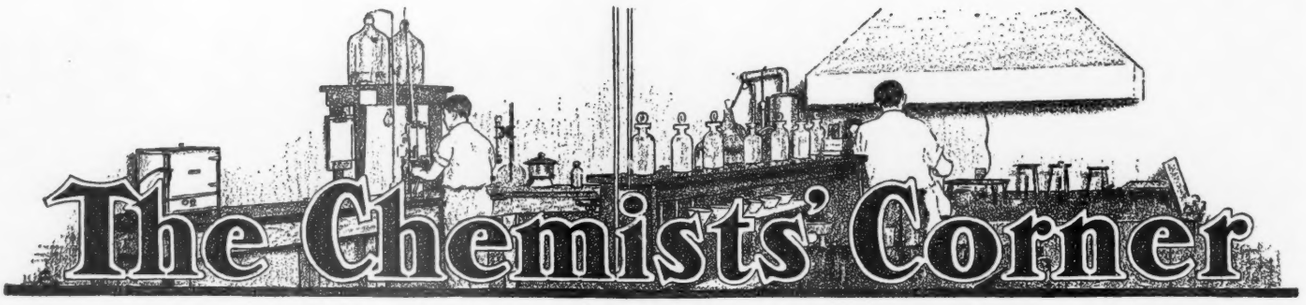


Fig. 8. Double stone box for two screens



Discoloration of Portland Cement Clinker

By Arthur J. Pool
Chief Chemist, Consolidated Cement Corp., Cement City, Mich.

TO SOME the discoloration of portland cement clinker may seem a matter of little practical importance. However, under certain circumstances, it can be a most unfortunate occurrence. Knowledge of conditions under which abnormally colored clinkers are apt to be produced is of much practical value; and, from a scientific standpoint, the cause of discoloration is a subject of considerable interest.

Inquiries into the causes of discoloration of clinker have engaged the attention during recent years of several investigators. A few papers covering the results of some of these inquiries have been published.

Review of the Literature

One writer[1] has observed that quenching clinkers with cold water changed the color of the clinker to light-brown. Forcing more air into the kilns and allowing the clinker to air-cool somewhat before sprinkling eliminated the difficulty. No ferrous iron was found in either quenched or air-cooled clinker. Blaise[2] attributes the discoloration in this instance to dirty coal.

Kuhl and Adam[3] claim that in sintering clinker at least a part of the ferric oxide present is uncombined because of the dissociation of calcium ferrite at about 1400 deg. C. With quick cooling the ferric oxide may remain free and tint the clinker according to the amount present. Yellow to red tints may persist even under somewhat reducing conditions, if reduction is not carried to completion.

Shroder[4] shows experimentally that yellow discoloration of clinker is due to rapid cooling in water or air from a high temperature and not to impurities in the cooling water, smoking by the coal or reduction or oxidation of iron compounds.

Blaise[5] observed that some kilns produced clinkers that were hard and black all the way through, while other kilns burning exactly the same chemical balance produced clinkers that were hard and black on the outside but had hard brown centers. Those of the latter type when quenched with water assumed a dirty yellow color.

Editor's Note

THE AUTHOR'S experiments and conclusions are certainly interesting and his work and originality are most commendable. The literature of the subject he discusses is scanty; and the author has stated in his letter to the editor that he will be pleased to see his article criticized, or additional references and suggestions given. —The Editor.

Investigations of burning conditions in the kilns producing the brown-centered clinkers disclosed that while there was being admitted to the kilns a preponderance of air over that required for efficient combustion, this air was not being mixed thoroughly with the fuel.

A stratified condition was found in the burner pipe with at least 80% of all the gas flowing in the upper one-third of the pipe and none at all in the bottom half. This, he says, caused the heavily laden gas stream flowing along the top to be projected farther into the kiln, and striking the clinker at the point of fusion carried on the work under reducing conditions. He assumes that all the clinker at this point was yellow; but that later, as the clinker progressed down the kiln, it came in contact with that portion of the burner stream carrying a surplus of air which oxidized the surface of the clinker but left the centers brown. That this is probably what happened is substantiated by the results of further experimenting.

Changes were made which permitted better mixing of air with the fuel with consequent improvement in combustion and the production of normal clinker. Moreover, tests were made using oil and coal for burning and it was found that the clinker could be turned brown or black at will by manipulation of the air supply. Unfortunately, chemical tests were not made to determine whether ferrous iron was present in the clinker. Blaise states, however, that the cement made from the clinker had a high iron content of about 4.5% and that "these things might be more easily noted in a cement of this character than in one somewhat lower in iron."

Recently Koyanagi[6] reported results of his investigations along this line. He concludes that the discoloration brought about by quenching very hot clinker with water is not caused by the state of oxidation of the iron. He shows that such clinker contains no greater amount of ferrous oxide than air-cooled clinker; whereas, clinker discolored by direct reduction or by overburning contains increased amounts of ferrous oxide and that the existence of ferrous oxide in these clinkers seems to be responsible for the discoloration.

According to Koyanagi, H. Kuehl[7] is of the opinion that discoloration occurs when ferric oxide, which is normally present in well-burnt clinker, is reduced to ferrous oxide.

Experimental

The lack of unity of opinion as to the causes of discoloration, together with the writer's own curiosity (excited by rather unpleasant first-hand practical experience with discolored clinker), led him to conduct a number of experiments designed to refute or to confirm certain conclusions made by other workers and, perchance, throw additional light upon the subject.

First, it was determined that a kiln was producing clinker that would not discolor when quenched with water. Next, changes were made in the coal feed and air supply which would allow a part of the coal to fall and burn upon the clinkers in the kiln.

A sample of these clinkers upon which the coal had burned was taken and without allowing them to cool appreciably a portion was dropped into distilled water contained

in a glass beaker. The remainder of the sample was allowed to air-cool. Those quenched with water were discolored; those allowed to air cool were not discolored. Neither portion reacted for ferrous iron.

This was evidence that combustion conditions played some part in producing clinker that would discolor upon being quenched with water.

Some of the air-cooled clinker was placed in a porcelain crucible and heated for several minutes in an electric furnace at about 1000 deg. C. and then quenched in water. No discoloration followed, yet a short time before the same clinker when first taken from the kiln was discolored when quenched in water

This was evidence that some change had taken place in the clinker either while cooling or during the heating in the furnace.

A sample of the air-cooled clinker was then placed in the crucible and mixed thoroughly with a small amount of powdered bituminous coal. The crucible was then covered and heated in the furnace. When it was judged that the coal had been consumed the crucible was removed and a portion of the clinker quenched in water; the remainder was allowed to cool in contact with the air. The quenched clinkers were badly discolored; those allowed to air cool were only slightly discolored. Both portions reacted for ferrous iron.

This experiment showed that incomplete combustion of coal in contact with clinker was capable of causing discoloration upon quenching, and was a small scale duplication of the experiment with combustion in the kiln, but with this difference in the results obtained: The clinker submitted to the laboratory test reacted for ferrous iron, whereas the clinker obtained in the kiln experiment did not, yet both had been discolored by practically the same treatment. Here was an enigma.

Similar experiments were made using wood-charcoal, cane sugar and sulphur. Any one of these invariably caused discoloration, but in checking the tests it was not always possible to get a reaction for ferrous iron.

The conclusion was that either the presence of ferrous iron was not essential for discoloration, or else the ferrous iron was present in such minute amounts that the test method employed was not sufficiently sensitive to detect it.

A solution of potassium ferricyanide was the reagent being used and tests were made to determine its approximate sensitivity. The result was that the ferrous iron could be detested readily and in dilutions up to 1 : 300,000.

Experiments were then made with the object of finding an explanation for the fact that ferrous iron was not always detected under what appeared to be the same conditions.

Weighed quantities of clinker and coal were used and the proportions of clinker and coal varied. As a result it was determined that 1 part of coal to 800 parts of clinker was sufficient to cause discoloration when the hot clinker was quenched with water, but was not sufficient to give a reaction for ferrous iron. A proportion of 1 : 600 resulted in very marked discoloration of the quenched clinker and appreciable discoloration of the air-cooled clinker, but still there was no reaction for ferrous iron. A proportion of 1 : 400 caused great discoloration of both quenched and air-cooled clinker and both reacted strongly for ferrous iron. It was noted that the degree of discoloration appeared to be proportional to the amount of coal used.

Discussion

The observation that hot clinkers will frequently discolor upon being quenched with water is a common one. From the experimental results obtained by the writer and observations made by others, notably Blaise and Koyanagi, the discoloration of clinker seems to be closely connected with and probably dependent upon reducing conditions during the burning process. This is not stating that discoloration is caused by reduction of iron, as it has been shown that discoloration can occur without ferrous iron being present in detectable amount. Ferrous iron appears to manifest itself only when reducing conditions are considerably greater than necessary to cause discoloration; the reduced iron apparently not being necessarily the cause but rather an accompaniment of the phenomenon. The failure of several investigators to detect ferrous iron in discolored clinkers obtained in actual operation would seem to be sufficient evidence that the discoloration is not dependent upon its presence.

The writer has seen discolored clinker and cement produced by burning a raw mix containing relatively large amounts of iron and sulphur. The clinker contained 4.23% Fe_2O_3, 0.52% SO_3 and 0.03% S. This clinker when allowed to air-cool was hard and black on the outside but the centers were hard and brown. When quenched in water the clinkers were turned a dirty-yellow color. Both air-cooled and quenched clinkers reacted for ferrous iron.

The source of the high iron and sulphur was traced to the calcareous material used in the raw mix. Only a very small portion of this material contained the excessive iron and sulphur and this portion could be easily identified by its color. Fortunately, the offending material could be discarded without difficulty and when its use in the raw mix was discontinued normal clinker and cement were again produced. Both types of raw mix were burned under the same conditions, and it has been found possible to produce discolored clinker and cement simply by using the objectionable material in the mix.

In connection with these observations it is desirable to point out that it was not determined whether burning conditions could be so regulated as to overcome the difficulty. From a practical and economical standpoint this solution probably would have been out of the question.

The conclusions reached by the writer were that a reducing condition was directly responsible for the discoloration, and that the presence of iron and sulphur in increased amounts was at least contributory factors.

It has been noted that these clinkers reacted for ferrous iron. However, whether ferrous iron actually was present in the clinker was not satisfactorily determined. This seemingly incompatible statement will be explained.

The clinker contained sulphides. Now in dissolving the sample in acid, preparatory to testing for ferrous iron, any sulphides present are decomposed with evolution of hydrogen sulphide and consequent reduction of some ferric iron. Thus in the presence of sulphides one is apt to get a reaction for ferrous iron whether it was originally present in the sample or not. Therefore, when ferrous iron is reported in materials in which decomposable sulphides are apt to exist, the actual presence of ferrous iron in the original sample may be questionable. Reports of specific amounts of ferrous iron in such materials are probably inaccurate. Hillebrand and Lundell[8] call attention to the uncertainty of ferrous and ferric iron determinations in rocks and minerals contaminated with sulphides.

With regard to the claim by Kuhl and Adam that discoloration is due to free ferric oxide liberated by the dissociation at high temperatures of calcium ferrite, it would seem that clinkers ought always to discolor when quenched with water. But they do not. If, as they suggest, reduction prevents the discoloration, why is it that ferrous iron is so seldom found in normally colored clinkers? Further, the writer's laboratory experiments, carried out at about 400 deg. lower than the stated dissociation temperature of calcium ferrite, resulted in discolored clinker produced under reducing conditions.

The rapid cooling of clinker cannot, it seems, be the primary cause of discoloration, because clinkers often fail to discolor upon being quenched with water. It is probable, however, that rapid cooling by quenching or other means abruptly cuts short oxidation and thus accentuates the discoloration. In the writer's experiments it was found that clinkers discolored with coal if allowed to cool out of direct contact with the air were only slightly less discolored than those cooled suddenly by quenching.

What actually takes place to cause the change in color has not yet been satisfactorily explained. Iron is the constituent in clinker responsible for its color. It is only natural then to assume that a change in color is due to some change in the iron. This assumption may be found correct, but it does not seem necessary to assume a change of valence in the iron as essential to color change in the clinker.

Conclusions

(1) A reducing condition acting upon clinker at high temperatures probably is essential to discoloration.

(2) The presence in the raw mix of relatively large amounts of iron and sulphur is in all probability a contributing factor toward discoloration.

(3) The presence of ferrous iron in discolored clinker is regarded as an accompaniment and not as an essential for discoloration.

(4) Sudden cooling of clinker is not a primary cause of discoloration.

(5) The exact cause or causes of discoloration of clinker have not been satisfactorily explained.

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8. Hillebrand and Lundell. Applied Inorganic Analysis, p. 786.

Laboratory Air Separator

A NEW AIR SEPARATOR is described by its designer, Paul S. Roller, in *Industrial and Engineering Chemistry*. From the examples given the new separator appears to do as good work as is done by the air analyzer, designed by Pearson and Sleigh for the Bureau of Standards, and it is quite as simple a device and has the advantage of being able to handle much larger samples. Mr. Roller is with the Nonmetallic Minerals Experiment Station, U. S. Bureau of Mines, New Brunswick, N. J.

The unique feature is the method of feeding. The charge is placed in a U-tube into which the air-separating current is led. The effect is to cause a self-circulation of the powder fed, which builds up in a mass against the direction of the current. This insures that all the feed is at some time acted upon by the air current and that the fines are carried into the separating tube. This part is an air elutriator of a common type connected with a filter that catches the fines that are blown over.

Experience with this separator shows that it works in accordance with Stokes' law, as the air analyzer does. This law has been written in many ways, according to the number of factors taken into account, affecting the fall of grains in air, water and other fluids.* The form used in the article is:

$$V = \frac{10^{-8}}{18} g \frac{Pd^2}{\eta}$$

*The simplest form and the one perhaps most used in separations in liquids is $V = KD^2 (\sigma - 1)$, in which K is a constant and σ the specific gravity of the grain.—Editor.

In this g is a constant of gravitation expressed in c.g.s. units, ρ is the density of particle in grams per c.c., η is the viscosity of the fluid in c.g.s. units and d is the diameter of the sphere in microns. In this series the diameter is taken as the arithmetical mean of the three dimensions or, more conveniently, the mean of the length and breadth.

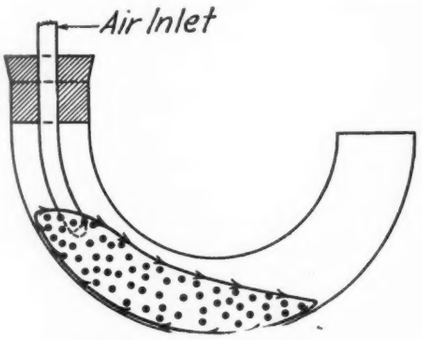
A table formed for cement from the above table is given in the article; taking η equal to 1.82×10^{-4} at 20 deg. C. for air:

VELOCITY OF FALL IN STILL AIR OF SPHERICAL PARTICLES CALCULATED FROM STOKES' LAW

Diameter Microns	Ratio, velocity of fall to density Cm./sec./ρ	Velocity of fall for cement (ρ eq. 3.1) Cm./sec.
2.5	0.0185	0.0572
5	0.0740	0.229
10	0.296	0.917
15	0.665	2.06
20	1.182	3.66
30	2.66	8.24
40	4.73	14.65
60	10.62	33.0

The article gives a number of microphotographs to show that the fractions separated by the new device are as good as those separated by the air analyzer and also that the grain sizes correspond with those given in the above table for various measured velocities of air current. In the case where insufficient time was given some fractions are contaminated with a little undersize, and in the case of soft materials there is some contamination with undersize produced by attrition, as there is in most if not all separating devices.

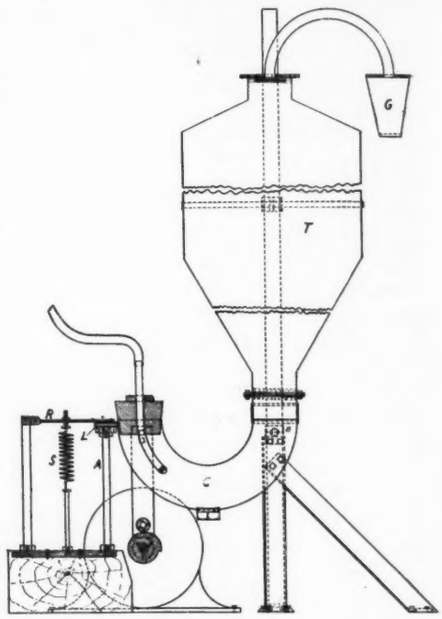
Referring to the illustration of the vertical section, C is the U-tube (a standard cast-iron 3-in. U-bend) into which the material to be separated is put. This is connected to the separating tube or elutriator T by a piece



Self circulation of charge

of rubber inner tube and flanges and gaskets. It is hung in a bearing at the end connected to the rubber tube and the other end is attached to a spring and rests on a bumper. It is vibrated about 1 cm. by the cam shown, the down stroke ending in a bump. The combination of the bump and the air blown through the tube causes the circulation of the feed in the U-tube.

The separator tubes, T, are made of sheet monel metal and are 7.6, 15.2, 30.4 and 60.8 cm. in diameter. The use of such a series, with the ratio 1:2:4:8, permits the separation of a corresponding series of particle size fractions with a constant rate of air flow, since it is the velocity in the tube T that controls the separation. Of the other factors affecting the separation, the main factor is the size of nozzle for the admission of air.



Vertical section of air separator

It has been found that at a given rate of air flow there is an optimum size nozzle for each separation. For separations above 5 microns 0.7 to 1 liter of air per minute to nozzle diameter squared in sq. mm. seems to be best. Above 5 microns a fine jet is needed to overcome the high electrostatic force between the grains.

The usual charge handled in tests was 1 kg., but the device has been arranged for continuous feeding and separation. To avoid frequent emptying of the filter bag that collected the fines, the bag was made to hold about 50 liters. Closely woven cloth and canvas were not satisfactory for filters, as the finest powder escaped through the pores. White piano felt was found quite satisfactory except for its tendency to shed hairs.

The article covers six pages of text and illustrations and gives very detailed results with rates of separation, the progress of separation and similar matters.

Investigations in Ceramics and Road Materials

THE Canada Department of Mines, Ottawa, Ontario, Canada, has issued its report No. 722 titled as above which contains considerable information of interest to the ceramic industry. About half of the book of 143 pages is devoted to two chapters that are of interest to the sand and gravel industry, as these chapters deal with the possible sources of road material in the provinces of Quebec and Prince Edward Island.

Preliminary Program of the National Crushed Stone Association Convention

ANNOUNCEMENT of the preliminary program of the 15th annual convention of the National Crushed Stone Association to be held in Pittsburgh, Penn., January 19-22, has been made.

The convention will open Tuesday morning, January 19, with an address of welcome by John S. Herron, president of the Pittsburgh city council. The response will be by F. O. Earnshaw, president of the Pennsylvania Stone Producers Association. A. L. Worthen will then give the presidential address. Members of the board of directors will individually report on business conditions in their respective territories. The "greeting" luncheon will be held at 1 o'clock.

The Tuesday afternoon session will be largely devoted to a discussion of low cost roads. H. P. Chapman, chief engineer, Ohio State Highway Department, will read a paper on "Methods of Reclaiming Old Macadam Roads." "New Developments in Bituminous Pavement Construction" will also be discussed. Dr. H. S. Hulbert, whose interesting paper at the 1931 convention received much favorable comment, will discuss "Modern Usages of Ancient Inherited Mental Tendencies." P. B. Reinhold, chairman of the association's research and advisory committee, will conclude this session with a presentation of the committee's activities and program. A. T. Goldbeck will lead the discussion following Mr. Reinhold's presentation.

Tuesday evening will be devoted to the manufacturers' division exposition of quarry equipment and machinery.

P. J. Freeman, chief engineer, bureau of tests and specifications, Allegheny county, Penn., will open the Wednesday morning session with a paper on "Effect of Coarse Aggregate on the Durability of Concrete." R. L. Fox, city engineer, Bethlehem, Penn., will follow this with a talk on stone sand in concrete construction. A plan for stabilizing the highway building program is the subject of a talk by Chas. M. Upham, engineer-director, American Road Builders Association.

Wednesday afternoon a group session for salesmen will be held and concurrently with it there probably will be a meeting of the National Agricultural Limestone Association. Mr. Goldbeck will address the sales group on "Do You Know?" He will present information of interest to assist in selling crushed stone. A discussion of "Advantages of a Uniform Sales Contract" is also planned.

Wednesday evening will be devoted to Pennsylvania night, the program and entertainment to be arranged by the Pennsylvania producers.

Thursday morning the session will be opened with a paper by F. E. Swineford, chief engineer, Ohio Crushed Stone Association, "Pavement Surfaces Suitable for Airport Construction." Dr. Ralph J. Watkins, director, School of Business Administration, University of Pittsburgh, will then read a paper on various business stabilization plans and Harold Williams, attorney, Boston, Mass., will discuss it. A paper will then be read on "Present Trends in Railroad Ballast Specifications," followed by a discussion led by Mr. Goldbeck. This will be followed by a talk on why adopt the association's uniform cost accounting system by Wm. E. Hilliard, chairman of the committee on uniform cost accounting. The morning session will be concluded with the report of the nominating committee.

A special luncheon will be held for cost accountants which will provide opportunity for an exchange of ideas regarding operation of the association's approved cost accounting system.

Thursday afternoon a group session for superintendents, operating men and manufacturers will be held. "Some Fundamental Considerations in the Preparation of Clean Stone" will be the first subject of discussion. This subject will be divided in two sections, the first dealing with washing methods of cleaning stone and the second with other methods of cleaning. It is said other subjects will be presented for discussion but a detailed program has not been announced as yet.

The 15th annual banquet will be held Thursday evening and assurance has been given that this event will not suffer in contrast to previous banquets.

"Ready-Mixed Concrete" will be the subject of the opening paper Friday morning. The viewpoint of both the engineer and producer will be considered and discussed. W. B. Burruss, who specializes in salesmanship and problems of personality will then talk on "Start from Where You Stand." Following this, Scott Turner, director, U. S. Bureau of Mines, will present the National Crushed Stone Association safety trophy to the Cape Girardeau quarry of the Marquette Cement Manufacturing Co. The convention will then be closed with reports from committees and the installation of officers.

Builds Rock Crushing Plant in South Carolina

AN unexpected development connected with the paving of the Waterloo highway has been the erection of a rock crushing outfit at the old Nichols quarry near Cold Point, S. C., by R. G. Lassiter and Co., the highway contractors.

The outfit consists of two Diesel engines, air compressors, two crushers, and a conveyor.

The plant will be continued in operation by the contractors as long as sale for the rock can be found, it is understood.—*Laurens* (S. C.) *Advertiser.*

To Rebuild Three Boats for Limestone Transport

BETWEEN 700 and 1000 men, mostly old employes, will return to work at the Lorain plant of the American Shipbuilding Co., shortly before Christmas to start reconstruction of three freighters for the American Steamship Co.

Officials at the company's Cleveland office closed the contract for the work recently.

While it is not in line with the company's policy to give out the contract price, marine men estimated that the work would entail an expenditure of approximately $1,000,000.

The three freighters, each of 10,000-ton capacity, will be converted into self-unloading vessels, to transport limestone from Alpena, Mich., to Fairport, Ohio, for the Diamond Alkali Co.

The Robins Conveying Belt Co. system will be used for the unloading equipment. It will be all-electric drive.

Upon completion of the work, the vessels will be renamed The Diamond Alkali, Standard Cement and Thunder Bay Qaurries.—*Lorain* (Ohio) *Times Herald.*

New Lime Products Plant in Idaho

ON NOVEMBER 19 the Banks Lime and Mineral Products Co., Boise, Ida., was incorporated and is starting operations at a deposit of calcium carbonate at Banks, Ida., which property is leased from the American Mines Development Co. for a period of 20 years.

It is said this deposit tests from 97 to 99% pure calcium carbonate and machinery to manufacture poultry grits, stock mineral and agricultural lime will be installed. Other lime products will also be produced, it is announced.

A. R. Masters, Boise, is president and general manager and John Marchetti is superintendent in charge of operations at Banks.

Index of Economic Reports

A NEW Index of Economic Reports has just been published by the Policyholders Service Bureau of the Metropolitan Life Insurance Co. This compilation, revised as of October 1, 1931, lists the titles of approximately 500 reports and articles on problems of business management which the Bureau has published and made available for general distribution. More than 100 new studies have been added since the previous edition of the index.

Illustrative of the material indexed in the booklet are the titles of a few representative reports. These include Making the Dealer an Adviser, Cooperative Marketing Activities in Business, The Accident-Prone Employee, Training Driver Salesmen and Budgeting Manufacturing Operations.

Hints and Helps for Superintendents

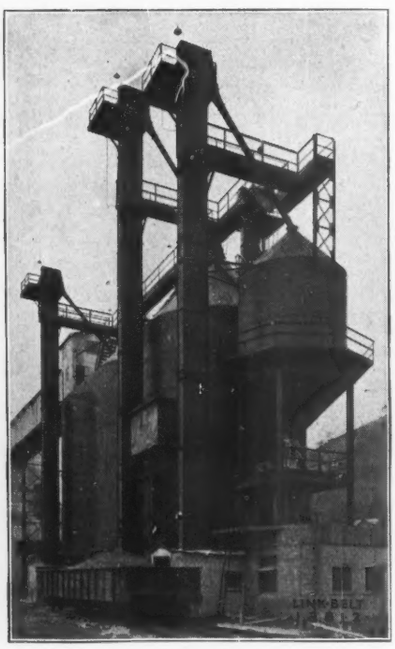
How to Obtain Maximum Service from a Bucket Elevator

By Ralph McMillan
Construction Superintendent, Link-Belt Co.

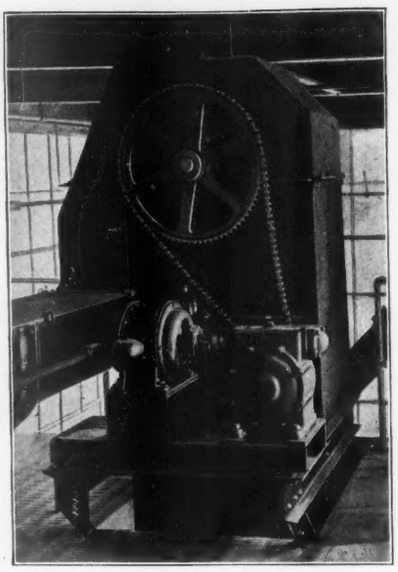
THINKING BACK over more than 15 years of experience in the selection, erection, maintenance and servicing of various types of bucket elevators I say seven points should be watched.

Avoid Overloading. In originally selecting a bucket elevator for a given purpose, the specifications of the material to be handled and the quantity to be elevated during a given time, with regard to the greatest load at any one interval, should be known. From this, an elevator designed to give the longest efficient service will be obtained. If the plant's capacity is expected to increase in the future, this fact should be borne in mind and the original elevator provided to care for this anticipated capacity.

Roominess. Sufficient room in the elevator casing is essential to long life, as ample space does away with the wear of buckets on the casing, and its resultant depreciation. Pits for the elevators should always be roomy to allow quick and easy access for adjustments, cleaning of the boot, and lubrication.



An interesting installation of bucket elevators



Speed reducer with chain drive are substantially mounted

Uniform Feed. On centrifugal discharge type elevators the receiving point should be well up above the foot shaft so that the major portion of the material is discharged directly into the buckets. A uniform feed is essential because the elevator will choke and stop if overloaded. This applies to continuous bucket elevators as well.

Proper Discharge. Make sure the discharge chute is of ample proportions, and placed at a suitable slant or angle, to insure immediate freeing of material, without danger of its backing up to the line of buckets.

Driving Mechanism. A positive drive gives best results, and this may be accomplished through the use of several efficient methods. The drive illustrated is compact and efficient. The use of these drives eliminates much of the usual noise and vibration, as well as annoyance of the elevator drive.

Lubrication. Best methods are through pressure systems, and the use of take-ups, pillow blocks, etc., having ample grease or oil storage facilities. Drives running in oil- or dust-tight casings give longest service.

Danger. When you hear material dropping down the elevator casing you know it is time to stop the elevator and investigate, as something must be wrong. If you don't know what to do, consult any bucket elevator manufacturer's engineer or service man.

Applying Screens in Sections

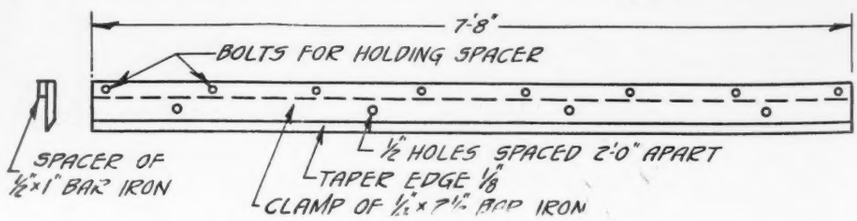
By Dare Paris
Monrovia, Calif.

IN MOST PLANTS the dust jacket is applied in one continuous piece or in halves. This method makes it difficult to repair the inner screens and to secure a true circumference. The life of a wire screen, if not of true circumference, is not long because of high spots which wear through quickly and long before the screen is worn out. By applying the wire screen on steel frames in four sections such an even circumference is obtained and the screen lasts much longer because it wears evenly throughout.

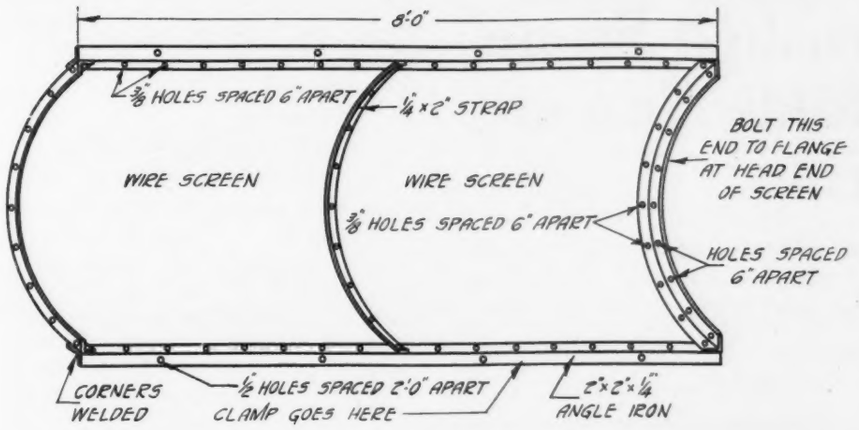
An accompanying sketch shows a quarter section of a 90-in. dust jacket on a revolving screen. Each screen should have two full sets of frames. While one set is in use the other can be in the shop and the wire screen put on at odd times at little cost. One section or all can be changed at any time.

For holding the sections together clamps are used as shown below. This eliminates many bolts and makes it much easier and quicker to change.

The clamp is made up of ¼x2½-in. strap iron. *A* is a piece of ½x1-in. iron for spacing and forms the back of the clamp. *B* are the holes for bolting the spacer to the 2½-in. strap iron which



Detail of clamp to hold sections together


8'-0"
⅜" HOLES SPACED 6" APART
¼ x 2" STRAP
WIRE SCREEN
WIRE SCREEN
⅜" HOLES SPACED 6" APART
BOLT THIS END TO FLANGE AT HEAD END OF SCREEN
HOLES SPACED 6" APART
CORNERS WELDED
½" HOLES SPACED 2'-0" APART CLAMP GOES HERE
2" x 2" x ¼ ANGLE IRON

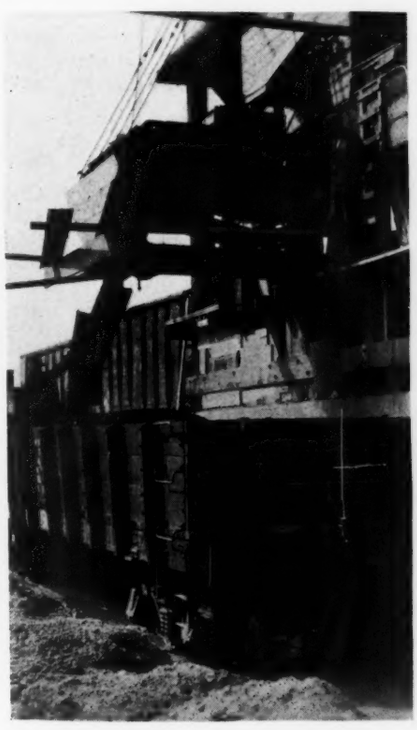
Steel frame of quarter section of 90-in. dust jacket on revolving screen

forms the clamp. Each side of the clamp should be ground off ⅛ in. on the inside edge which will make the clamp easier to apply.

Counter-Weighted Chute Distributes Material in Car

AT THE PLANT of the Waterford Sand and Gravel Co., Waterford, Ontario, a sectional chute is suspended from the conveyor discharge. The first section of this chute is 3½ ft. long, and distributes gravel in the center of the car. The second section is about 2½ ft. and when used as an extension is long enough to load the remainder without moving the car.

To make this chute easy to operate, since it has a considerable weight when operating, a 30-gal. oil drum was attached as a counter-weight. It has been loaded so that only a slight force is required to hold the spout when either length of chute is being used.

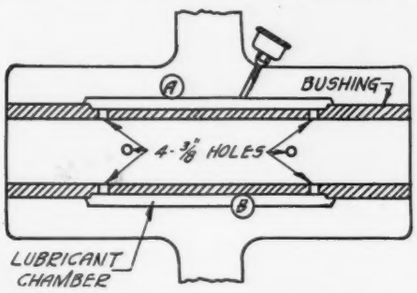


Counter-balanced, sectional chute

Improvement for Loose Pulley

By Charles Labbe
Death Valley, Calif.

PLAIN LOOSE PULLEYS never have much lubrication. Often it is an inaccessible oil hole or a plain grease cup



Repair for worn loose pulley

screwed in the hub. With the steady pull of the belt it does not take long for a pulley to get loose on the shaft, after which it wobbles and becomes noisy.

The remedy would be to bore out the hub and fit inexpensive roller bearings if the shaft is not of too large size, otherwise reboring and bushing are in order.

In boring out the pulley for a bushing, one may have a counterbore as shown at *A* and the middle part of the bushing turned down at *B*. The bushing can be either bronze, babbit or cast iron; in practice the material is of lesser importance than the lubrication.

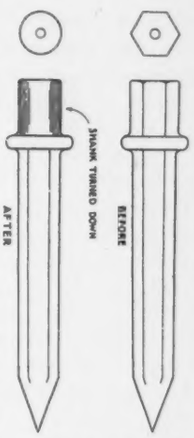
When the bushing is made and before pressing it into the pulley's hub, drill four holes near each end of the recess. No oil groove is necessary.

The counterbore in the pulley and the recess in the bushing forms an oil or grease chamber of ample capacity and once filled up by grease by the grease cup, will require much less attention and lubricant than formerly.

Combining Jackhammer and Moiling Machine

ACCORDING to an Arizona jackhammer operator, the company with which he was connected had 200 jackhammers in operation and 50 air-driven moilers, and it was found that by changing the design of the steel the jackhammers could be used for both drilling and moiling.

Many companies have two types of jackhammers: one, incorporating the ratchet, used for drilling; and the other, very similar, without the ratchet, used for moiling ground or breaking boulders, or for breaking concrete.



Make the shanks round

Regardless of the type of drill steel used, the tools can be consolidated simply by making the shanks round. The chuck on the rachet machine will continue to rotate while the moil steel will not. After six months' trial the wear on chucks cannot be noticed; besides, the shank on drill steel is not tempered as hard as the machine chuck, and the little wear that may result will be on the steel.—*Explosives Engineer.*

Reflector and Protector for Light

ONE OF THE NEW PLANTS to be built in 1931 is that of the Twin Cities Sand and Gravel Co. near Minneapolis, Minn., and part of the summer this new plant had to be operated two shifts, so night lighting of the plant was necessary.

A novel reflector was provided to light the area below a belt conveyor. The reflector consists of a new galvanized washtub, which is underslung to the gallery supporting the belt conveyor, as shown in the illustration. The reflector not only directs the light as desired but protects the light globe from damage.

This bath tub works up side down

N. Y. State Crushed Stone Association Holds Annual Meeting

THE ANNUAL MEETING of the New York State Crushed Stone Association was held December 11, 1931, at the Syracuse hotel, Syracuse, N. Y. Thirteen producers were represented with a total attendance of 31. The meeting was called to order by President A. S. Owens, and a number of matters of general interest were discussed and action taken on several.

The washed stone situation was discussed in detail by A. G. Seitz, chairman of the contact committee. It was felt that the order of State Highway Commissioner Brandt of Albany, requiring washed, or otherwise equally cleaned, stone in the 1932 specifications, was subject to more than one interpretation and that it would be well to have a more definite understanding of the details of the order. This matter is to be further clarified at a meeting of the committee with Commissioner Brandt to be arranged by the secretary for a later date.

Information received by President Owens relative to a change in the gravel specifications to permit the acceptance of less than 90% crushed gravel as optional with crushed stone was discussed, and the matter is to be given further attention by the contact committee.

The reports of the president, secretary and treasurer of the association were received and approved, and the recommendation of the treasurer that a change in the financial structure of the association be made was submitted to a committee which is to report at the next meeting.

The officers selected by the nominating committee for the ensuing year were elected by unanimous ballot. The new officers are: J. L. Heimlich, LeRoy Lime and Crushed Stone Corp., president; H. E. Rainer, Federal Crushed Stone Corp., vice-president, and G. E. Schaefer, General Crushed Stone Co., secretary and treasurer.

The association was addressed by Secretary Harry R. Hayes of the New York chapter of the Associated General Contractors of America in regard to the proposed legislation for 1932 to be submitted to the joint legislative committee on lien law revision. Most of the objectionable features of last year's Fearon bill, which passed both houses of the legislature but was vetoed by the governor, seem to have been corrected in the new proposals, and it is expected that the new bill to be introduced will now be acceptable. Mr. Hayes' suggestions are to receive the further consideration of the association.

It was decided to hold the next meeting at Pittsburgh, Wednesday evening, January 20, 1932, in connection with the National Crushed Stone convention. The association also voted to go to the Pittsburgh convention in special cars which will leave Albany and Syracuse Monday morning, January 18, and will arrive in Pittsburgh that evening.

J. L. Heimlich, newly-elected president

It is expected that there will be about the same delegation from New York as in previous years.

The meeting was closed with a farewell address by President Owens, thanking the members for their cooperation during the year and extending his best wishes to the new officers.

Attendance

ACTIVE MEMBERS

Buffalo Crushed Stone Co., Buffalo, N. Y.: James Savage, A. J. Hooker.
Dolomite Products Co., Rochester, N. Y.: J. H. Odenbach, Harvey N. Clark, A. F. Sickles.
Eastern Rock Products, Inc., Utica, N. Y.: A. S. Owens.
Federal Crushed Stone Corp., Buffalo, N. Y.: H. E. Rainer, H. M. McNabb.
General Crushed Stone Co., Syracuse and Rochester, N. Y.: A. G. Seitz, F. C. Owens, F. F. McLaughlin, Geo. E. Schaefer.
Jointa Lime Co., Glens Falls, N. Y.: H. J. Russell.
Le Roy Lime and Crushed Stone Corp., Le Roy, N. Y.: Geo. E. Merchant.
L. and M. Stone Co., Prospect, N. Y.: William McGrew, Milo Crouse.
Mohawk Limestone Products Co., Mohawk, N. Y.: Fred Rutschow.
North Jersey Quarry Co., Morristown, N. J.: F. W. Schmidt, Jr.
Pekin Stone Products Co., Lockport, N. Y.: M. J. Wurtenburger, E. E. Wilson.
Wickwire Spencer Steel Co., Gasport, N. Y.: W. E. Foote.
Worlock Stone Co., Canastota, N. Y.: Claude Ellis.

ASSOCIATE MEMBERS

William Anderson, Hercules Powder Co., Buffalo, N. Y.; Hiram Barnes, Sweeney and Boland, Rochester, N. Y.; M. D. Caldwell, Atlas Powder Co., Buffalo, N. Y.; Harry E. Hayes, Associated General Contractors, Albany, N. Y.; L. B. Perry, Acme Road Machinery Co., Rochester, N. Y.; Eugene Rago, Rago Brothers, Syracuse, N. Y.; N. S. Snyder, Link-Belt Co., Buffalo, N. Y.

Another City Considers Operating Quarry

THE CITY of Utica, N. Y., having need of 15,000 tons crushed stone, and owning a quarry of its own, has put 200 men to work, this number to be increased to about 300. The city authorities feel that in working up this stone as a part of the emergency employment program it can effect a material saving in the cost of the stone, and at the same time provide work at reasonable wages, for a considerable force of men.

Oneida owns a municipal stone quarry. It can make use of many tons of crushed stone on the streets of the city next spring and summer. It is not, however, possessed of equipment suitable for stone crushing purposes, and the authorities are inclined to the belief that to lease or purchase crushing machinery would be rather poor economy.

However, the matter has not as yet been definitely turned down, and perhaps will not be, final action being postponed until the survey of need, now under way, has been completed.—*Oneida* (N. Y.) *Dispatch.*

Approves Feldspar Tariff Change

THE PRESIDENT has approved the report of the tariff commission with respect to the duty on feldspar, which indicated that a maximum reduction of 50% should be made in the existing rate of $1.00 per ton on crude feldspar but that no change should be made in the duty on ground feldspar. Under the act of 1922, crude feldspar was on the free list and ground feldspar was dutiable at 30% as at present.

The investigation was instituted June 15, 1931, in response to an application of one domestic importer, received by the commission April 23, 1931.

The report of the commission shows that the cost of Canadian feldspar, exclusive of the cost of grinding, but including the weighted average cost of transportation from mines to grinding mills and from grinding mills to principal markets in the United States, exceeds the corresponding cost of domestic feldspar by $2.44 per ton and that after taking into consideration the difference in price between Canadian and domestic feldspar and making allowance for the possible effect upon costs of the depreciation in the Canadian dollar, that the maximum reduction in duty permitted by law, namely, 50 c. per ton is warranted. The new rate will go into effect 30 days after the date of the proclamation by the President.

In its report the commission did not specify any change in the duty on ground feldspar, the rate on which remains at 30%.

Editorial Comment

Aggregate Specifications

The national specifications for concrete aggregates tentatively adopted at the meeting last June of the American Society for Testing Materials should be not only read but carefully studied by every producer of aggregates before they attend the coming January conventions of their industries. Aggregate specifications now are where cement specifications were a generation ago, when a single company found it had more than 200 different cement specifications to meet. Then the A. S. T. M. specification was written and adopted and today it has practically the force of a legislative enactment. The national associations of aggregate producers may be trusted to guard the interests of the industries they represent as a whole, but they cannot know the interests of individual producers. Every producer should know what effect this specification will probably have on his business before it, or some modification of it, is adopted.

Only a few years ago it was considered impossible to write an aggregate specification for the United States as a whole, the differences in aggregate materials and the requirements of concrete for different climates and localities were so diverse—although attempts were made as early as 1921. Then Committee E-5, of the American Concrete Institute, consisting of representatives of the three aggregate associations as well as those of engineering associations, settled on certain characteristics which all aggregates must have to make satisfactory concrete. Their recommendations were adopted in 1929 as a tentative standard by the Institute and either partly or wholly by some other bodies. Other specifications, especially the Federal specification adopted in 1930, have had their influence. New ideas came from greater information about aggregates. The new specification is a composite of the two specifications referred to, with some novelties which have come from later study, all of which producers should examine carefully.

One novelty is the use of a graded sand (approximately one-half mine run and one-half standard Ottawa sand) for the mortar strength test. This is to be used with the new tentative standard testing method, C-31T. It calls for a constant water-cement ratio, which is obtained by mixing both the sample and the standard sand (graded) with cement pastes, which have been mixed to a water ratio of 0.9 and to the same consistency as shown by a flow table. It is evident that more or less sand of the sample will be required according to its water requirement, which is only partly determined by its fineness modulus. The use of a flow table will be inconvenient in many places. Possibly the mortar testing type of concrete flow trough, described by Burmister in his paper read at the A. S. T. M. meeting, would serve the purpose. Anyway, this is a section in which sand producers are vitally interested, and they should study it and determine for themselves if modifications seem desirable.

The uniformity section says that a sample of fine aggregate shall be submitted with the bid, and that a variation of more than 0.20 either way from the fineness modulus of this sample shall be cause for rejection, unless the engineer in charge adjusts his proportions to admit it. This is in the Federal specifications now in force. Many producers think it too severe a requirement, but it is one that really modern plants can meet or they can be arranged to meet it.

There is a gradation requirement for both fine and coarse aggregates and these were evidently written to keep the producer from including too much pea gravel (⅛- to ½-in.) in his shipments. The judgment of the engineer is to decide whether the mix is workable or can be finished properly, which is probably sufficient. At the same time it would seem that a somewhat more definite specification might have been drawn from the knowledge that we now have of gradation. The work of Walker and Proudley and others has shown that there can be very considerable quantities of such material added to the aggregate without seriously detracting from the strength or the finishing quality of the concrete, so that it should not be difficult to set limits.

There is an even greater indefiniteness in the section which provides for a sodium sulphate test, which says only that the aggregate shall "pass" such a test. Since this is a tentative standard, would it not be well to set some limits for passing? Gonnerman and Ward found that a loss of 15 to 20% by weight in five cycles of sodium sulphate for coarse aggregates and a loss of 10 to 12% for sand are reasonable limits according to our present knowledge of the matter. To be sure, they also say, as do Lang and others, that the exposure to which the concrete is to be subjected should be taken into account, but this too could be provided for.

The specification provides for six standard gradations of coarse aggregates. In the past the committees on standardized sizes of the aggregate associations have not been too successful in convincing the memberships that standardizing on a few sizes was essential to the future of the industry. But it is evident that standardization is wanted by many producers and many users of aggregates, and the committee was probably right in including it. Especially is this true now that aggregates are so much used in separate sizes. The gradations and the tolerances are those which have been proven and accepted to be reasonable and the industry will gain by their adoption.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	Dividend
Allentown P. C. 1st 6's[27]	12-16-31	75	85	
Alpha P. C. new com.[2]	12-14-31	8¾	9	25c qu. Jan. 25
Alpha P. C. pfd.[2]	12-14-31	90	105	1.75 qu. Dec. 15
Amalgamated Phosphate Co. 6's, 1936[19]	12-12-31	94	100	
American Aggregates com.[19]	12-12-31	3½	5	75c qu. Mar. 1
American Aggregates pfd.[19]	12-12-31	10	30	1.75 qu. Oct. 1
Amer. Aggr. 6's, w.w.[19]	12-12-31	45⅝	48	
Amer. Aggr. 6's, ex-w.[19]	12-12-31	43⅝	46	
Amer. L. & S. 1st 7's[27]	12-16-31	85	90	
American Silica Corp. 6½'s[39]	12-16-31	No market		
Arundel Corp. new com.	12-15-31	26 actual sale		75c qu. Oct. 1
Bessemer L. & C. Class A[4]	12-11-31	.....	12	50c qu. Aug. 1
Bessemer L. & C. 1st 6½'s[4]	12-11-31	.....	58	
Bloomington Limestone 6's[27]	12-16-31	18	24	
Boston S. & G. new com.[37]	12-12-31	5	7	15c qu. Oct. 1
Boston S. & G. new 7% pfd.[37]	12-12-31	32	37	87½c qu. Oct. 1
California Art Tile, A	12-11-31	1	5¼	43¾c Mar. 31
California Art Tile, B[40]	12-10-31	.....	3	20c qu. Mar. 31
Calaveras Cement com.	12-11-31	.....	3	
Calaveras Cement 7% pfd.	12-11-31	.....	60	1.75 qu. Oct. 15
Canada Cement com.[42]	12-14-31	5½	5¾	
Canada Cement pfd.[42]	12-14-31	66	68	1.62½ qu. Dec. 31
Canada Cement 5½'s[42]	12-14-31	89	92	
Canada Crushed Stone bonds[42]	12-14-31	60	70	
Canada Crushed Stone com.[42]	12-14-31	5	.....	
Certainteed Products com.	12-15-31	2½	2¾	
Certainteed Products pfd.	12-15-31	18	25	1.75 qu. Jan. 1
Cleveland Quarries	12-15-31	.....	50	25c qu. Dec. 1
Columbia S. & G. pfd.	12-15-31	88	91	
Consol. Cement 1st 6½'s, A[44]	12- 2-31	5	10	
Consol. Cement notes, 1941[27]	12-16-31	No market		
Consol. Cement pfd.[27]	12-16-31	.....	55	
Consolidated Oka Sand and Gravel (Canada) 6½'s[42]	12-14-31	93	95	
Consolidated Oka Sand and Gravel (Canada) com.[41]	10-27-31	.....	7	
Consolidated Oka Sand and Gravel (Canada) pfd.[41]	12- 8-31	57	.....	1.75 qu. Oct. 10
Consol. Rock Prod. com.[9]	12-10-31	25c	35c	
Consol. Rock Prod. pfd.[9]	12-10-31	2	2½	43¾c qu.June1,'30
Consol. Rock Prod. units[35]	12-10-31	3½	4½	
Consol. S & G. pfd. (Can.)	12-14-31	50	55	1.75 qu. Nov. 16
Construction Mat. com.	12-15-31	1	5	
Construction Mat. pfd.	12-15-31	5	10¼	87½c qu. Aug. 1
Consumers Rock and Gravel, 1st Mtg. 6's, 1948[35]	12-10-31	55	65	
Coosa P. C. 1st 6's[23]	12-12-31	30	.....	
Coplay Cem. Mfg. 1st 6's[19]	12-12-31	50	60	
Coplay Cem. Mfg. com.[33]	12-12-31	5	7½	
Coplay Cem. Mfg. pfd.[33]	12-12-31	25	40	
Dolese and Shepard	12-15-31	20	23	$1 qu. Jan. 1
Dufferin Pav. & Cr. Stone pfd.	12-14-31	.....	57	1.75 qu. Oct. 1
Dufferin Pav. & Cr. Stone com.	12-14-31	.....	5	
Edison P. C. com.[32]	12-12-31	1½	.....	
Edison P. C. pfd.[32]	12-12-31	5	.....	
Federal P. C. 6½'s, 1941[19]	12-12-31	71¼	76	
Giant P. C. com.[2]	12-14-31	.....	5	
Giant P. C. pfd.[2]	12-14-31	.....	15	1.75 s.-a. Dec. 15
Gyp. Lime & Alabastine, Ltd.[42]	12-14-31	.....	5½	10c qu. Oct. 5
Gyp. Lime & Alabastine 5½'s[42]	12-14-31	60	67	
Hermitage Cement com.[11]	12-12-31	13	18	
Hermitage Cement pfd.[11]	12-12-31	60	70	
Ideal Cement, new com.	12-15-31	20	22	50c qu. Jan. 2 & 25c ex. Dec. 22
Ideal Cement 5's, 1943[29]	12-12-31	97	99	
Indiana Limestone units[27]	12-16-31	No market		
Indiana Limestone 6's	12-15-31	16 actual sale		
International Cem. com.	12-16-31	17½	18	75c qu. Dec. 31
International Cem. bonds, 5's	12-15-31	64 actual sale		Semi-ann. int.
Iron City Sand & Gravel 6's, 1940[36]	11-27-31	.....	80	
Kelley Is. L. & T. new stock	12-16-31	15	16⅞	50c qu. Oct. 1
Ky. Cons. Stone com.	12-14-31	.....	2	
Ky. Cons. Stone pfd.	12-14-31	.....	50	1.75 qu. May 1
Ky. Cons. St. 1st Mtg. 6½'s[38]	11- 4-31	.....	70	
Ky. Cons. Stone V. T. C.[38]	11- 4-31	.....	2	
Ky. Rock Asphalt com.	12-14-31	3½	4¼	40c qu. Oct. 1. '30
Ky. Rock Asphalt pfd.	12-14-31	33	36	1.75 qu. Dec. 1
Ky. Rock Asphalt 6½'s	12-14-31	85	88	
Lawrence P. C.	12-14-31	.....	20	$1 qu. June 30
Lawrence P. C. 5½'s, 1942[2]	12-14-31	39	43	
Lehigh P. C. com.	12-15-31	5¼	6	25c qu. May 1
Lehigh P. C. pfd.	12-15-31	79	80½	1.75 qu. Jan. 2
Louisville Cement[7]	12-11-31	125	.....	
Lyman-Richey 1st 6's, 1932[13]	12-11-31	95	.....	
Lyman-Richey 1st 6's, 1935[13]	12-11-31	92	.....	
MarbleheadLime 6's[14]	12-12-31	No market		
Marbelite Corp. com. (cement products)	12-11-31	.....	75c	
Marbelite Corp. pfd.	12-11-31	1	.....	50c qu. Oct. 10, '30
Material Service Corp.	12-15-31	14	15	50c qu. June 1
McCrady-Rodgers 7% pfd.[22]	12-11-31	40	.....	87½c qu. Sept. 30
McCrady-Rodgers com.[22]	12-11-31	10	15	75c qu. Jan. 26
Medusa Portland Cement	12-15-31	12½	15	75c qu. Apr. 1
Michigan L. & C. com.[6]	12-12-31	45	.....	
Missouri P. C.	12-15-31	12	15	25c qu. Oct. 31
Monolith Portland Midwest com.[9]	12-10-31	75c	1	
Monolith Portland Midwest pfd.[35]	12-10-31	1	2	
Monolith P. C. com.[9]	12-10-31	1½	2	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	12-10-31	3½	4	40c s.-a. Jan. 1
Monolith P. C. units[9]	12-10-31	8½	10	
Monolith P. C. 1st Mtg. 6's[9]	12-10-31	65	70	
National Cem. (Can.) 1st 7's[27]	12-16-31	93	98	
National Gypsum A com.[27]	12-16-31	1½	3	
National Gypsum pfd.[27]	12-16-31	33	36	*1.75 qu. Jan. 2,'32
National Gypsum 6's[3]	12-17-31	69	73	
Nazareth Cement com.[25]	12-12-31	3	.....	
Nazareth Cement pfd.[25]	12-12-31	60	.....	
Newaygo P. C. 1st 6½'s[27]	12-16-31	65	73	
New England Lime 6's, 1935[19]	12-12-31	10	30	
N. Y. Trap Rock 1st 6's	12-15-31	75 actual sale		
N. Y. Trap Rock 7% pfd.[30]	11-30-31	65	.....	1.75 qu. July 1
North Amer. Cem. 1st 6½'s	12-15-31	17½ actual sale		
North Amer. Cem. com.[27]	12-16-31	50c	2½	
North Amer. Cem. 7% pfd.[27]	12-16-31	3	5	
North Shore Mat. 1st 5's[15]	12-16-31	80	.....	
Northwestern States P. C.[31]	12-14-31	.....	75	$2 Apr. 1
Ohio River S. & G. com.	12-14-31	.....	8	
Ohio River S. & G. 7% pfd.	12-14-31	.....	98	
Ohio River S. & G. 6's[16]	12-12-31	65	75	
Oregon P. C. com.[9]	12-10-31	8	12	
Oregon P. C. pfd.[9]	12-10-31	80	85	
Pacific Coast Aggr. com.[40]	12-10-31	.....	50c	
Pacific Coast Aggr. pfd.[40]	12-10-31	.....	75c	
Pacific Coast Cement 6's[5]	11-27-31	77	.....	
Pacific P. C. com.	12-11-31	.....	12	
Pacific P. C. pfd.	12-11-31	.....	55	1.62½ qu. Oct. 5
Pacific P. C. 6's[5]	11-27-31	90	.....	
Peerless Cement com.[21]	12-11-31	.....	1	
Peerless Cement pfd.[21]	12-11-31	.....	15	1.75 qu. Apr. 1
Penn.-Dixie Cement com.	12-15-31	1⅛ actual sale		
Penn.-Dixie Cement pfd.	12-15-31	5	8	
Penn.-Dixie Cement 6's	12-15-31	40 actual sale		
Penn. Glass Sand Corp. 6's	12- 2-31	93	.....	
Petoskey P. C.	12-15-31	3¼	4¼	15c qu. Apr. 1
Port Stockton Cem. com.[9]	12-10-31	No market		
Riverside Cement com.[9]	12-10-31	.....	12	
Riverside Cement pfd.[9]	12-10-31	55	60	1.50 qu. Nov. 1
Riverside Cement, A	12-11-31	.....	9	15c qu. Feb. 1
Riverside Cement, B[9]	12-10-31	70c	1	
Roquemore Gravel 6½'s,[37]	12-12-31	98	100	
Sandusky Cement 6½'s, 1931-37[19]	12-12-31	80	100	
Santa Cruz P. C. com.	12-11-31	80	.....	$1 qu. Oct. 1
Schumacher Wallboard com.	12-11-31	.....	5	25c qu. June 27
Schumacher Wallboard pfd.	12-11-31	11	12	50c qu. Nov. 15
Southwestern P. C. units[35]	12-10-31	225	275	
Standard Paving & Mat. (Canada) com.	12-14-31	2	3	50c qu. May 15
Standard Paving & Mat. pfd.	12-14-31	.....	59½	1.75 qu. Nov. 16
Superior P. C., A	12-11-31	30	32½	27½c mo. Jan. 1
Superior P. C., B	12-11-31	7¼	11	25c Dec. 21
Trinity P. C. units[31]	12-14-31	80	85	
Trinity P. C. com.[31]	12-14-31	12	.....	
U. S. Gypsum com.	12-15-31	15½	16	40c qu. Dec. 31
U. S. Gypsum pfd.	12-15-31	111½	116¼	1.75 qu. Dec. 31
Wabash P. C.[21]	12-11-31	.....	21	
Warner Co. com.[16]	12-12-31	5½	6	25c qu. Oct. 15
Warner Co. 1st 7% pfd.[16]	12-12-31	.....	75	1.75 qu. Jan. 1, '32
Warner Co. 6's, '41	12-15-31	38 actual sale		
Warner Co. 1st 6's 1944 w.w.	12-11-31	67	85	
Whitehall Cem. Mfg. com.[30]	12-15-31	90	.....	
Whitehall Cem. Mfg. pfd.[30]	12-15-31	60	.....	
Wisconsin L. & C. 1st 6's[15]	12-16-31	80	.....	
Wolverine P. C. com.	12-15-31	.....	3½	15c qu. Nov. 15
Yosemite P. C. A com.[9]	12-10-31	1	1½	

*Dividend covers quarter from Oct. 1 to Dec. 31, 1931. Dividends in arrears, after this payment, amount to $21.50 a share on the stock.

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Beadling & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bank & Trust Co., Chicago. [16]J. S. Wilson, Jr., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]Dan Powell & Co., Los Angeles.

Ideal Cement Pays Extra Xmas Dividend

THE IDEAL CEMENT CO. (Denver, Colo.) directors meeting December 10 declared an extra Christmas dividend of 25c. a share and added unexpected cheer to the holiday season of owners of 458,271 shares of the company's stock.

In addition, the directors declared the regular quarterly payment of 50c. a share on the corporation's stock.

The extra will be payable December 22, to stockholders of record December 15. The regular will be paid January 2, to stock of record December 15.

Last year the company paid a 50c. extra dividend.

A statement by R. J. Morse, vice-president and general manager, said surplus piled by the corporation in its best years would be called upon to pay part of the dividends. Surplus is ample, he added, to pay the regular dividends throughout all of the year of 1932.

"Earnings of the Ideal Cement Co. this year," said Mr. Morse, "on account of depressed prices and subnormal shipments, will not cover the regular dividend, but the directors considered that the stockholders should be given the benefit of the surplus built up during the previous prosperous years of operations.

"With the knowledge that the cash position of the corporation is such that the payment of the regular dividends of $2 per share for the year 1932 is assured, and that an extra of 25c. per share at this time is justified, an extra Christmas dividend of 25c. per share was declared."

The Ideal Cement Co. has been paying Christmas extras to its stockholders for more than ten years.

The company will disburse $447,353.25 for bond interest and for the dividend payments authorized. On January 1, $103,650 in bond interest will be paid. The regular quarterly dividend amounts to $229,135.50. The extra amounts to $114,567.75.

Increases in tonnage of unfilled orders for two consecutive months, as was the case in May and June of this year, is believed to result from the low price which is causing consumers to build up their plant stocks somewhat.—*Denver* (Colo.) *Post.*

Canada Cement Earnings

EARNINGS of Canada Cement Co., Montreal, Que., for the year ended last month, are currently reported on about the same level as in the preceding year. The volume of business transacted fell off somewhat, but economies in operations enabled the management to hold up profits. This is along the lines of the statement made by J. D. Johnson, president of the company, toward the end of last October.

Developments over the past 12 months include the rehabilitation and extension of the Port Colborne plant. This plant, which is the last of the company's units to be so equipped, will be turned over to the wet process. This system has proven more efficient, besides eliminating the dust problem.

Over the past two or three years large sums of money have been spent on equipping the other plants at Winnipeg, Hull and Montreal East for the wet process.

The amount of business handled during the 1931 fiscal year is reported to have been about 12% below that of the preceding year.

Some of the large contracts included one of 25,000 bbl. from the city of Winnipeg, a substantial order from the city of Hamilton for its filtration plant, one from Ottawa for its water system and filtration plant, one from the city of Montreal for about 200,000 bbl., and a contract from the city of Brantford for its annual supply of cement.

On the basis of earnings approximating those of last year, the 1931 report is expected to show preferred stock earnings of about $7.46 a share. This compares with dividend requirements of $6 which the president said would be continued.

Earnings on the common stock in 1930 were equal to 33c. a share on the 600,000 shares outstanding. It is more than likely that earnings applicable to this stock for 1931 will be that figure.

Outlook for the company during the coming year is uncertain at present. The big terminal scheme of the Canadian National Railways, a potential large consumer, has been given a temporary hoist. Highway building may be on a fairly extensive scale, though this work may be limited in favor of other forms of roadbuilding. Unemployment relief plans in various cities may bring about the use of a large quantity of cement, but such business is uncertain at the best.—*Financial Post* (Toronto, Ont.).

Reports Record Year for 1931

DIRECTORS of the Dolomite Products Co., Inc., Rochester, N. Y., have declared an $8 dividend on the preferred stock and a $1 dividend on the common stock, payable December 20. The company has completed the best year in its history, said John H. Odenbach, president and general manager, and has produced 500,000 tons of stone at the two stone plants in Gates and Penfield, and 125,000 tons of sand at its sand and gravel plant in Penfield.

The Dolomite Products Co., Inc., had a modest beginning 10 years ago and now represents a capital investment of more than $2,000,000. Monroe county labor is hired exclusively by the company. Mr. Odenbach said that orders booked for next year, or in prospect, indicate that 1932 will exceed even this year, and plans are being made accordingly. Matthew P. Odenbach is vice-president of the company, Frank J. Waddell is secretary and Harvey N. Clarke is general superintendent.—*Rochester* (N. Y.) *Democrat and Chronicle.*

Asks Privilege of Waiving Sinking Fund Payments

HOLDERS of first mortgage 6% bonds of the Iron City Sand and Gravel Co. have been informed by the Union Trust Co. of Maryland, as trustee for the bonds, that the gravel company proposes to enter into an agreement with its bondholders waiving payment of sinking fund for the purpose of retiring bonds until after June 1, 1933.

The trustee has on hand from payments made during the last 12 months an amount sufficient to pay the coupons maturing December 1 upon this issue, but is advised by its counsel that the greater part of the amount so held, representing installments that fell due during the first six months of the period, should not without consent of bondholders be applied to the payment of the interest falling due December 1, it was stated.

If, however, a sufficient number of bondholders will consent to the application of such money now in the trustee's hands toward the payment of the interest due at that time, then that interest can be paid from the source mentioned, the notice continued.

It is also deemed advisable by the management of the corporation, it was added, that such waiver of so much of the sinking fund as would be applicable to purchase and retirement of bonds be extended to cover the period up to June 1, 1933, so as to enable the company to continue its business advantageously during that period.—*Baltimore* (Md.) *Sun.*

Reports Progress of Gypsum, Lime and Alabastine, Ltd., of Canada

THOUGH earnings of Gypsum, Lime and Alabastine, Ltd., Canada, are on a lower scale this year it is stated that the company still maintains a good liquid position and owes no money to the banks. At the end of last year bank loans totaled $35,000.

The reduction in the company's sales and earnings has been reflected in dividends on the common stock which are now paid at the rate of 10 c. a share quarterly. Payments at the beginning of the year were made at the rate of 80 c. annually but this payment was cut in half in October.—*Toronto* (Canada) *Financial Post.*

Recent Dividends Announced

Alpha P. C. (qu.)	0.25,	Jan.	25
Dolese & Shepard (qu.)	1.00,	Jan.	1
Ideal Cement com. (qu.)	$0.50,	Jan.	2
Ideal Cement com. (extra)	0.25,	Dec.	22
Pennsylvania Glass Sand pfd. (qu.)	1.75,	Jan.	2
Republic P. C. pfd. (qu.)	1.75,	Dec.	1
Southwest. P. C. com. (qu.)	1.50,	Jan.	1
Southwest. P. C. pfd. (qu.)	2.00,	Jan.	1
Superior Portland Cement Cl. A (mo.)	0.27½,	Jan.	1
Superior Portland Cement B	0.25,	Dec.	21

Pacific Coast Aggregates Refinancing Program

ANNOUNCEMENT of re-financing plans for the bond and debenture obligations of Pacific Coast Aggregates, Inc., San Francisco, Calif., is expected within the next few days. A committee headed by Livingston B. Keplinger, official of Bankamerica Co. and a director of Pacific Coast Aggregates, is understood to be working out details of the reorganization at present.

Although no definite word as to the form that the refinancing is to take was forthcoming from officials of the company or representatives of the committee, it is reported that formation of a protective committee representing the bond and debenture holders is in contemplation.

Pacific Coast Aggregates, as of January 2, 1931, had outstanding $3,976,000 in first mortgage 6½% sinking fund gold bonds, and $1,476,000 in ten-year sinking fund 7% convertible debentures. Annual interest charges on the basis of that face value of the securities amount to $361,760.

Minimum sinking fund requirements for the bonds in 1931 amounts to $50,000, and in 1932 to $100,000. The same requirement applies to the debentures. The next payment on each of the issues, interest for a semi-annual period, is due January 1, 1932.

Proposed Refinancing of Egyptian Cement

THE following agreement dated October 31, 1931, for readjustment of the Egyption Portland Cement Co.'s general and refunding 5½% bonds has been proposed: (1) The maturity of all outstanding bonds shall be extended to January 2, 1940. (2) The rate of interest shall be 6½% per annum from and after November 10, 1931. (3) Bonds shall be redeemable on any interest date on 60 days' notice at 105 to May 10, 1935 and at 1% less each year thereafter. (4) The company will pay annually into the sinking fund 6% of the net earnings of Peerless Cement Corp., said earnings to be before depreciation, but after interest and federal taxes, as determined by good accounting practice, and shall be based upon the company's earnings for each calendar year beginning with the year 1932. Said moneys paid into the sinking fund shall be used to retire the outstanding bonds of said issue at par and accrued interest, said bonds to be drawn by lot by the trustee from the serials first maturing, as provided in the original trust deed.

The readjustment plan shall become operative as soon as the bankers, Peabody and Co., Chicago, in their discretion shall determine that a sufficient number of bonds have been deposited with Detroit Trust Co., Detroit, Mich., Depositary, to make it advisable to declare the plan operative.

Order Reduced Rates on Cement Compound

A REDUCTION in freight rates on cement compound from Berkeley, W. Va., to Chicago, has been ordered by the Interstate Commerce Commission. The order is directed to the Baltimore and Ohio railroad and the Pennsylvania railroad, and was the result of a complaint by the North American Cement Corp.

The new rate, to go into effect by March 10, 1932, under the ruling, must be 25% of the contemporaneous first-class rate, minimum weight not to exceed 50,000 lb.

The commission explained the compound is for floor use and a different commodity from cement waterproofing for which a charge of 10c. a lb. is charged, about five times the price of the floor product.

Crushed Stone as a Xmas Gift!

SEVEN TONS of crushed stone delivered in a Mack truck gaily decorated with holiday greens and carrying a huge card marked, "To Mr. and Mrs. W. H. Lamborn, Avondale, Pennsylvania, from the Gang," was one of the oddest and at the same time most useful Christmas presents delivered by Santa Claus last Xmas day.

Mr. Lamborn was building a new house and the employes of his two electrical stores in Avondale and West Chester, hit on the idea of giving him the stone for his new driveway. It was delivered the day after Christmas by John U. Trego, a Downingtown road builder, and it aroused a lot of interest on its 20-mile ride. Indeed the Philadelphia newspapers used a little "Box" story of the event, which is more than they do for the thousands of similar loads which travel the local roads every day.

—Thos. H. Wittkorn.

Marquette Cement to Expand

MARQUETTE Cement Manufacturing Co., Chicago, Ill., has started work on the enlargement of its plants at Cape Girardeau, Mo., and La Salle, Ill., involving $500,000 and the employment of 250 men. The program includes the installation of 15 new type coolers. Theodore G. Dickinson, president of the company, states a number of large orders have been received recently, while a renewal of a government contract calls for 6000 bbl. of cement a day.—*Wall St.* (N. Y.) *Journal.*

Called for Redemption

PENNSYLVANIA Glass Sand Corp. 1st 6s, 1952, in amount of $60,000, have been called for redemption January 1, 1932, at 105 at Brown Brothers Harriman and Co., New York, Philadelphia and Boston. On December 1, 1931, Bond No. 4244 previously called was still unredeemed.

I. C. C. Modifies Its Ruling in 15% Rate Increase Case

WITHOUT approving or disapproving the carriers' plan, or their agency for its execution, to lend money from the pool to be created by the increased rates, the Interstate Commerce Commission, in a report on reconsideration in the Fifteen Per Cent Case, 1931, Ex Parte 103, 178 I. C. C. 539, has modified its report so that the carriers may put their loan plan into operation. It has also modified its plan so as to make changes in the application of the increases, converting charges in dollars a car to cents a ton or a hundred pounds, and imposing a charge of 2 c. on all less-than-carload shipments. The number of commodities has been increased so as to show greater detail and some commodities have been changed from one list to another.

There are no changes in group classifications of the major products of the rock products industry.

Plans for carrying into effect the loan plan were not completed when it was submitted to the Commission as a substitute for the one submitted in its report. Obtaining assent of carriers to the modified pooling plan, it was understood, would be one of the major tasks to be considered.

Owing to the amount of work to be done, there is no certain indication as to when the increased rates will go into effect.

Wisconsin Operators Discuss High Liability Insurance Rates

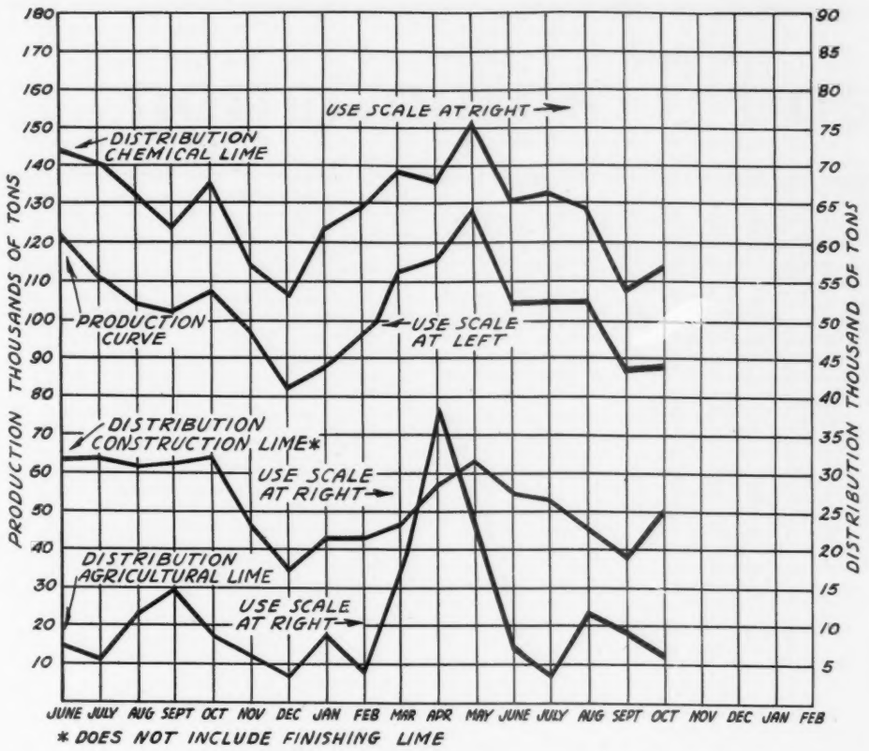
OWNERS of quarries and monument plants in Wisconsin have been discussing with the industrial commission recently ways and means for securing lower insurance rates from liability companies for workman's compensation hazard.

Because the occupational disease risk resulting from the dust from polishing and grinding of stone, the rates for this hazard have jumped in Wisconsin from over $6 to $12 a thousand. In states not protecting against occupational diseases the rate for marble and granite workers is about $1.54 a thousand.

The industrial commission officials, however, say that the high rates only apply to the portions of the payrolls, for the men engaged in the work from which the dust diseases are contracted.

Organization of a mutual insurance company for protection from the hazard is one of the plans proposed.

A monument manufacturer claims that some monument plants may be removed from Wisconsin to Illinois because of the high insurance rate. The Illinois workman's compensation law does not award compensation for the dust diseases.—*Madison* (Wis.) *Journal.*


PRODUCTION THOUSANDS OF TONS
DISTRIBUTION THOUSAND OF TONS
USE SCALE AT RIGHT
DISTRIBUTION CHEMICAL LIME
PRODUCTION CURVE
USE SCALE AT LEFT
DISTRIBUTION CONSTRUCTION LIME*
USE SCALE AT RIGHT
DISTRIBUTION AGRICULTURAL LIME
USE SCALE AT RIGHT
JUNE JULY AUG SEPT OCT NOV DEC JAN FEB MAR APR MAY JUNE JULY AUG SEPT OCT NOV DEC JAN FEB
* DOES NOT INCLUDE FINISHING LIME

Operations of lime industry for 16 months

Production and Distribution of Lime

THE ACCOMPANYING CHART shows statistics of operations in the lime industry for a 16-month period ending with October, 1931.

This information, supplied by the National Lime Association, represents only 43% of the total lime production of the country. Reasonable accuracy in estimating total production should be obtained from it by doubling the amounts shown in the chart.

Investigate Rock Deposits Near Kingston, N. Y.

FOR SOME TIME negotiations have been under way by a New York stone crushing concern to obtain suitable property for its business in the vicinity of Kingston, N. Y., and it was said that the firm's investigators were favorably impressed with the property which it has investigated along the Rondout creek.

On December 4 a report was received stating the property had been purchased and that the concern was considering an outlay of about $150,000 in order to establish its business.

Considerable of the property mentioned in the report is owned by the estate of Daniel Zoller. The son said that parties had been looking over the property, but that so far no agreement had been reached as to its sale and what negotiations were under way had not been closed in so far as he knew.—*Kingston* (N. Y.) *Leader.*

New Pavement Awards in November

CONCRETE PAVEMENT yardage awarded in the United States during the month of November, divided according to roads, streets and alleys, as reported by the Portland Cement Association, and the totals for the ten months' period ending November 28, 1931, are:

	Yardage awarded during Novermber, 1931	Yardage awarded to date, November 28, 1931
Roads	3,558,911	107,638,198
Streets	762,798	20,694,863
Alleys	39,531	791,621
Total	4,361,240	129,124,682

Tests Chalk Deposits for Cement Plant Location

R. B. ALFORD of New Orleans, La., director and construction engineer of the Mississippi Portland Cement Co., has been actively engaged in sinking tests through the Salem chalk formations around West Point, Miss., for the purpose of locating a site for the proposed cement plant to be erected in that section. Plans for this plant in Mississippi have been under discussion for some time.

Core drillings are being made where surface samples show the best results. The lime carbonate content must be above 50% to attain the requirements demanded by the company, Mr. Alford announced and it is his opinion that much of this quality of product can be found in Clay county.—*Meridian* (Miss.) *Star.*

Sand-Lime Brick Production and Shipments in November

THE FOLLOWING DATA are compiled from reports received direct from 20 producers of sand-lime brick, located in various parts of the United States and Canada. The number of plants reporting is the same as for the October estimate, published in the November 21 issue. The statistics below may be regarded as representative of the industry in the U. S. and Canada.

The usual falling off in production of sand-lime brick during the winter months, this year more than ever due to general business conditions, is reflected in the statistics for the month of November. A considerable decrease is shown in production, and rail and truck shipments, stocks on hand and unfilled orders also show decreases.

Average Prices for November

Shipping point	Plant price	Delivered
Dayton, Ohio	$11.50	$12.50
Detroit, Mich.	.....	14.50-15.50
Grand Rapids, Mich.	.....	13.50
Jackson, Mich.	13.00	.....
Milwaukee, Wis.	9.00	11.00
Minneapolis, Minn.	8.00	10.50
Mishawaka, Ind.	11.00	.....
Pontiac, Mich.	11.50	13.50
Saginaw, Mich.	11.00	.....
Sioux Falls, S. D.	12.00	13.50
Syracuse, N. Y.	18.00	20.00
Tampa, Fla.	8.25	.....
Toronto, Ont., Can.	9.90	12.00

Statistics for October and November

	†October	*November
Production	6,520,594	3,189,925
Shipments (rail)	977,000	633,600
Shipments (truck)	4,657,294	3,349,982
Stocks on hand	12,346,671	10,035,476
Unfilled orders	11,437,000	10,485,000

†Twenty plants reporting; incomplete, six not reporting unfilled orders. *Twenty plants reporting; incomplete, one not reporting production, and nine not reporting unfilled orders.

Notes from Producers

Grande Brick Co., Grand Rapids, Mich., reports that it has made the following shipments: 20,000 brick for the state police barracks at Travers City, Mich.; 35,000 for the post office at Bayne City, Mich.; 83,000 to the Kalamazoo Paper Co. for its addition in Kalamazoo, Mich., and 81,000 for the Bethany Reformed Church at Kalamazoo.

Plant City Brick Co., Tampa, Fla., reports that it is now making shipments of brick for the government post office and customs house at Key West, Fla.

To Develop New Mexico Potash Deposits

ORGANIZATION of a new company to develop potash deposits in New Mexico has been completed. The New Mexico Potash and Chemical Co. is headed by Chas. Lamb and W. G. Halthusen. A statement from officials says that the company has already arranged for sinking shafts and drilling for potash and has contracted anticipated production for three years.

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week of December 12:

TRUNK LINE ASSOCIATION DOCKET

28146. **Sand,** in open-top cars, carloads (See Note 2), from Tatesville, Penn., to Ferndale, Kings, Penn., $1.30; Walsall, Paint Creek, Border, Foustwell, Holsopple, Jerome Junction, Hooversville, Stoyestown, Friedens, Quemahoning Junction, Ralphton, Stoughton, Boswell and Acosta, Penn., $1.40 per net ton. Reason: Proposed rates are comparable with rates to Patton, Cherry Tree, Jerome, Penn., etc.

M-1911. **Sand and gravel,** carloads (See Note 2), from Farmingdale to Bayside, N. J., inclusive, and Cape May, N. J., to Drummondville, Que., 33½c per 100 lb. Reason: Proposed rate is comparable with rates to Quebec, Que.

28153. **Sand,** N. O. I. B. N. in O. C. (other than blast, engine, foundry, glass, molding, quartz, silex or silica), carloads (See Note 2), from Cadosia and Fishs Eddy, N. Y., to Wilkes-Barre, Plymouth (Branch), Parsons, Miners Mills, Hudson, Laflin, Yatesville, Pittston, Avoca, Penn., $1.05 per net ton. (See Note 5.)

28165. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads. **Stone, natural** (other than bituminous asphalt rock), **crushed, coated with oil, tar or asphaltum,** carloads (See Note 3), rates in cents per net ton:

	—From—	
To	So. Bethlehem, N. Y. Prop.	So. Amsterdam, N. Y. Prop.
Melrose Jct., N. Y.	.....	$1.90
High Bridge, N. Y.	.....	1.90
Morris Heights, N. Y.	.....	1.90
Kings Bridge, N. Y.	.....	1.90
130th Street, N. Y.	.....	1.90
Westchester Ave., N. Y.	$1.80	1.90
Port Morris, N. Y.	1.80	1.90
Claremont Park, N. Y.	1.80	1.90
Fordham, N. Y.	1.80	1.90
Williams Bridge, N. Y.	1.80	1.90
Woodlawn, N. Y.	1.80	1.90
Mt. Vernon, N. Y.	1.80	1.90
Dunwoodie, N. Y.	1.80	1.90
Bryn Mawr Park, N. Y.	1.80	1.90
Nepperhan, N. Y.	1.80	1.90

(See Note 5.)

27852, Sup. 2. **Sand blast, building, engine, glass, quartz, foundry, silex and silica,** carloads (See Note 2), to Oshawa and Kingston, Ont., from Perth Amboy District, Metuchen to Maurer, N. J., 22½c per 100 lb., from Cape May, Downer, Glassboro, Grenloch, Williamstown, Williamstown Junction, N. J., Hancock and Round Top, Md., 24½c per 100 lb.

27853, Sup. 2. **Sand, blast, building, engine, glass, quartz, foundry, silex and silica,** carloads (See Note 2), to Petersboro, Ont., from Perth Amboy District, Metuchen to Maurer, N. J., 22½c per 100 lb., from Cape May, Downer, Glassboro, Grenloch, Williamstown, Williamstown Junction, N. J., Hancock and Round Top, Md., 24½c.

28170. To cancel rate of $1.10 per net ton on **limestone, crushed,** carloads (See Note 2), from Greer, W. Va., to Somerfield, Penn. Classification basis to apply. Reason—Investigation develops that no traffic has moved for some time and no prospect of future movement, therefore rate is obsolete.

28171. Cancel from P. R. R. I. C. C. 509 commodity rate of $1.70 per net ton on **crushed stone,** carloads, from Pleasant Gap, Penn., to Dushore, Penn. Classification basis to apply. Reason—The present rate published in error.

28179. **Sand, blast, building, engine, foundry, glass, quartz, silex and silica,** carloads (See Note 2), from Cape May, Farmingdale, Glassboro and Toms River, N. J., to Brighton, Ont., 24½c per 100 lb. Present rate, 36c per 100 lb. Reason—Proposed rate is comparable with rates to Port Hope, Toronto, Ont., etc.

28187. **Limestone, unburned, ground,** carloads, minimum weight 50,000 lb., from Natural Bridge, N. Y., to Vergennes, Middlebury, Vt., 19c. and Rutland and Manchester, Vt., 21½c per 100 lb. Present rate combination. (See Note 5.)

28190. Establish on **crushed stone,** carloads (See Note 2), from Hyndman, Penn., to destinations in Maryland and West Virginia, rates based on flat scale for distance will be published to specific points of destination on the B. & O. R R. and connections, except to stations on South Branch of B. & O. R. R., Millen to Petersburg, W. V., inclusive, rates will be 10c per 2,000 lb. higher, and to stations on connecting lines 20c per 2,000 lb. higher than rates based on flat scale. Rates in cents per ton:

15 miles and under	60
25 miles and over 15	70
40 miles and over 25	80
60 miles and over 40	90
80 miles and over 60	100
100 miles and over 80	110
125 miles and over 100	120
150 miles and over 125	130
175 miles and over 150	140
200 miles and over 175	150

Reason: Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

28191. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads (See Note 2), to U. & D. R. R. points, West Hurley, Pine Hill, Stamford, Oneonta, Tannersville, Hunter, N. Y., and various, from Marlboro, N. Y., rates ranging from $1.25 to $1.85 per net ton; from Tompkins Cove, N. Y., rates ranging from $1.55 to $2.15 per net ton. (See Note 5.)

28202. **Sand,** other than glass, carloads (See Note 2), from Goshen, Va., to Rosslyn, Va., $1.70 per net ton. Present rate, $2.22. Reason—Proposed rate is comparable with rate from Highland Park, Va., to Washington, D. C.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—To meet motor truck competition.

Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

CENTRAL FREIGHT ASSOCIATION DOCKET

29919. To amend C. F. A. L. Tariff No. 197-N, naming rates on **cinders, gravel, etc.,** from Chicago, Joliet, Thornton, Kensington, Ill., etc., to points in Indiana, Illinois, Michigan and Ohio, by providing for additional application for account of the C. & E. I. Ry., in connection with that now published on page 12 of said tariff, viz.: "Rates named herein for account of the C. & E. I. Ry. apply only from Thornton, Ill., and only on crushed stone, agricultural limestone (not ground or pulverized), or limestone, agricultural, unburned, in bulk in open top cars only.

29952. To establish on **stone, crushed or ground,** in bags or packages, in box cars, carloads, from Ingomar, O., to Franklin (Warren county), O., rate of 110c per net ton. Present, 190c (9½c per cwt.), 83.33% of sixth class.

29959. To establish on **stone, crushed,** in bulk, in open top cars, and **stone screenings,** in bulk, in open top cars, carloads, from Kokomo, Ind., to Indiana destinations:

Representative points

	Pres.	Prop.		Pres.	Prop.
Lake Ciecott..	76	70	Plymouth	88	85
Seafield	88	76	South Bend....	101	95
Mexico	92	75	Long Cliff.....	81	65
Pettysville	92	80	Flora	92	75
Newton	95	80	Sedalio	95	80
Col'bia City ..	105	90	Colfax	100	85
La Otto	127	105	Crawf'dsville	110	95
Moore	127	110	Marion	88	80
Grass Creek ..	85	80	Renner	100	85
Culver	88	80	Dunkirk	(*)	95

*Sixth class.

Route: Via P. R. R. direct.

Rates in cents per net ton.

SOUTHERN FREIGHT ASSOCIATION DOCKET

56180. **Sand and gravel,** Elizabethton, Tenn., to Clinch Valley division of the N. & W. Ry. It is proposed to establish rates on the above-named commodity from and to the above-named points ranging from 140c to 160c. Statement of the proposed rates will be furnished upon request.

56185. **Phosphate rock, crude lump or phosphate rock, crude ground,** or **limestone, phosphatic,** carloads, St. Louis, Mo., East St. Louis, Ill., Memphis, Tenn., Evansville, Ind., Brookport, Cairo, Metropolis and Mounds, Ill., when from Southern points to Colorado and Utah points. It is proposed to revise the existing rates to be in cents per net ton as follows: To Colorado points, from Brookport, Cairo, Mounds, Metropolis, Ill., and Evansville, Ind., 748; from East St. Louis, Ill., and St. Louis, Mo., 688; from Memphis, Tenn., 804. To Utah points from Brookport, Cairo, Mounds, Metropolis, Ill., and Evansville, Ind., 986; from East St. Louis, Ill., and St. Louis, Mo., 926; from Memphis, Tenn., 1042c per net ton.

56205. **Sand, gravel, slag, stone and chert,** carloads, between stations on the V. & C. S. R. R., and between stations on the V. & C. S. on the one hand and points in Southern territory on the other. It is proposed to establish main line or trunk line basis of rates on sand, gravel, slag, stone and chert, carloads, to, from and between stations on V. & C. S. R. R.

ILLINOIS FREIGHT ASSOCIATION DOCKET

3987-A. **Sand and gravel** (See Note 3), from Pit 5 (Crescent) and Pekin, Ill., to Edwardsville, Ill. Present—No through rates in effect. Proposed—$1.14 per net ton.

4973-B. **Limestone, ground or pulverized,** carloads (See Note 3), but not less than 60,000 lb., from Valmeyer, Ill., to Chicago, Ill. Rates per net ton. Present—$2.21. Proposed—$1.82.

6250. **Sand (lake, river and bank,** other than sand, loam), carloads, usual minimum weight, from Gary, Miller (Lake County), and Willow Creek, Ind. Rates per net ton.

To	Pres.	(1) Prop.
Danville, Ill.	$1.64	$1.39
Decatur, Ill.	1.76	1.39
Hoopeston, Ill.	1.64	1.39
Litchfield, Ill.	1.89	1.51
Quincy, Ill.	2.14	1.77
Springfield, Ill.	1.89	1.39
East St. Louis, Ill.	2.14	*1.89
St. Louis, Mo.	2.11	*1.64

*(1) See Wabash Tariff I. C. C. 6501.

6255. **Limestone, ground,** carloads (See Note 3), but not less than 40,000 lb., from Cox, Ill., to various points in Illinois on B. & O. R. R. and C. & E. I. Ry., north of the line of the Pennsylvania R. R., from East St. Louis, Ill., to Terre Haute, Ind. Rates per net ton.

To points in Ill.	Delivery	Pres.	Prop.
Beardstown	B. & O.	*	$1.50
Springfield	B. & O.	*	1.45
Taylorville	B. & O.	*	1.40
Tower Hill	B. & O.	*	1.35
Cowden	B. & O.	*	1.25
Pana	C. & E. I.	*	1.15
Mode	C. & E. I.	*	1.00
Kinmundy	C. & E. I.	*	.90
Salem	C. & E. I.	*	.80
Mt. Vernon	C. & E. I.	*	.70
Karnak	C. & E. I.	*	.70
Joppa	C. & E. I.	*	.70

*Combination of distance rates.

6259. **Sand, common, foundry, glass, molding or silica,** carloads (See Note 3), but not less than 40,000 lb., from Ottawa, Ill. Rates per net ton, to Mt. Vernon, Ill. Present—$1.90. Proposed—$1.64.

6291. **Sand and gravel,** carloads, from Worth, Ill., to Chicago, Ill. (for Wabash Ry. deliveries). Rates per net ton. Present—65. Proposed—55.

6322. **Sand and gravel,** carloads (See Note 3), but not less than 40,000 lb., from Buckhart, Ill. Rates per net ton to representative Illinois points.

	Pres.	Prop.		Pres.	Prop.
Beardstown..	$1.50	$0.76	Beecher City	1.70	.76
Virginia	1.42	.76	Altamont	1.74	.88
Gurney	1.31	.76	Edgewood ..	1.78	.90
Springfield ..	1.01	.63			

6322-Sub. 1. **Sand and gravel,** carloads (See Note 3), but not less than 40,000 lb., from Buckhart, Ill. Rates per net ton, to representative Illinois points.

	Pres.	Prop.		Pres.	Prop.
E. Springf'd	$1.01	$0.63	Long Creek	1.31	.76
Keys	.95	.63	Atwood	1.48	.76
Roby	.72	.63	Newman	1.70	.80
Blackland ..	1.01	.63	Hume	1.73	.80

6323. **Sand** (except blast, engine, foundry, glass

or molding), and **gravel**, also **sand and/or gravel pit strippings**, straight or mixed carloads (See Note 3).

From	To	Rates per net ton Pres.	Prop.
Cairo, Ill.	Johnston City, Ill.	90	85

6335. **Sand and gravel**, carloads (See Note 2), but not less than 40,000 lb., from Muscatine, Ia., to Edwardsville, Ill.

Rates per net ton. Present—$1.64; proposed—$1.50.

6350. **Sand and gravel**, carloads (See Note 3), but not less than 40,000 lb., from Alton, Ill., to C. & I. M. Ry. stations, viz., Beechley, Cimic, Pawnee, Sicily, Humphrey, Kincaid, Callaway and Taylorville, Ill. Rates per ton—Present, $1.01; proposed, 86c.

6367. **Agricultural limestone**, carloads, from Cordova, Ill., to C. R. I. & P. Ry. destinations in Illinois. Rates per net ton. to representative points in Illinois.

	Pres.	Prop.		Pres.	Prop.
Colona	$1.20	$0.93	DePue	1.20	1.13
Geneseo	1.20	.98	Peru	1.20	1.18
Atkinson	1.20	1.00	Crampton	1.20	.92
Sheffield	1.20	1.04			

5356-B. **Stone, crushed**, in open top cars (See Note 3), but not less than 40,000 lb., from Thornton, Ill., to Decatur, Ill., rates per net ton. Present, 98c; proposed, $1.01.

6379. **Crushed stone**, carloads (See Note 3), but not less than 40,000 lb., will apply, from Dubuque, Ia., to points in Illinois. Rates per net ton.

	Pres.	Prop.		Pres.	Prop.
Daggets	$1.90	$0.95	Polo	$2.00	1.10
Chadwick	1.90	.95	Stratford	2.00	1.10
Milledgeville	1.90	1.00	Oregon	2.10	1.10
Hazelhurst	2.00	1.00			

WESTERN TRUNK LINE DOCKET

Sup. 1 to 7076-B. **Sand, alumina** (crude), minimum weight 50,000 lb., from Marysville, Utah, to Copper Cliff, Ont. Please refer to Docket Bulletin No. 3013, dated July 3, 1931, Docket 7076-B. This subject has now been canceled from the docket.

I. C. C. Decisions

23398. Gypsum Rock. Medusa Portland Cement Co. vs. Pennsylvania et al. Rates, gypsum rock, New Brighton, N. Y., to York, Penn., unreasonable over the direct route, to the extent they exceeded or may exceed $1.80 a net ton, minimum 90% of the marked capacity of the car, but not less than 80,000 lb., but not unreasonable over other routes. Reparation awarded. New rate to be established not later than February 29. Chairman Brainerd noted concurrence in part.

3446 — 23155 — 3419, Plasterboard and Plaster. The Commission, in I. and S. 3446, plasterboard, between points in southern territory; 23155, Certainteed Products Corp. vs. A. and R. et al., and I. and S. 3419, plasterboard between points in official classification territory and from that territory to points in Canada, has determined rates in typical instances, found justified some changes in tariffs that were filed for purposes of clarification and condemned changes that would result in increased rates. The suspended schedules were filed, about the time the complaint was made, by the railroads with a view to having the tariffs in the future provide rates which they contended were provided by the tariffs which were being changed for clarification.

In its head-note summary of its decision the Commission said that it found that combination rates charged on carloads of plaster and plasterboard from points of origin in Iowa, Michigan, New York, Ohio, Oklahoma, Texas and Virginia to destinations in southern territory were generally inapplicable and that it had determined the applicable rates. Further, it said it found applicable, with certain exceptions where there were overcharges, combination rates charged on carloads of the commodities named, from the states hereinbefore mentioned, to destinations in official territory and in Kentucky which were in part governed by official classification. These declarations relate to the matters presented in the complaint class.

The Commission said the schedules in I. and S. 3446, on the traffic between points mentioned, in connection with the findings in the complaint case had been shown to make unjustified increases in rates. Therefore it ordered the suspended schedules canceled. As to the two schedules suspended in I. and S. 3419, it said that one was found to effect no change in rates and that therefore it was permitted to become effective. The other, the report said, it was found, would effect unjustified rate increases and should be canceled.

Uncertainties created by the rule in the class tariffs, that combinations would apply where they were lower than the through class rates, the Kelly rule for making rates by combination, and a rule for the ascertainment of rates on plasterboard by adding or not adding 3.5 c. to the rates on plaster, caused the filing of the formal complaint. The complaint alleged that the rates charged on many of the complainant's shipments were inapplicable. The Commission was asked to determine the applicable rates and to award reparation for any overcharges found. The National Gypsum Co. of Buffalo, N. Y., and the National Gypsum Co., Chicago, Ill., intervened in the complainant's behalf. A hundred or more disputed rates, each more or less different in form of publication, the Commission said, were shown with complete tariff references. The complainants and interveners said they were typical of hundreds of rates. The Commission said that, on analysis, the rates and tariff situations exhibited as typical tended to arrange themselves into a much smaller number of groups and that it was believed that the ascertainment of a single rate selected from each of the smaller groups would dispose of virtually all the matters in issue. It appeared further, the report said, that rates on mixed carloads of board and plaster were disputed largely or wholly because of the disagreement as to the rates on straight carloads of plasterboard. Therefore, it said, it would not separately treat the rates on mixed carloads.

Nine situations were dealt with. The rate from Acme, Tex., to Andalusia, Ala., was found to have been 40 c. and not 37.5, as claimed by the shippers. The rate from Acme to Athens, Ala., was 39 c. and not 33, as claimed by the shippers, nor 45, as claimed by the carriers. The rate from Acme to Headland, Ala., was found to be 36 c. In so finding that rate the Commission affirmed its finding in plasterboard from and to southern territory, 151 I. C. C. 385, but added the further opinion that no minimum weight should be observed in connection with a differential when the differential was added to combinations, untreated by the use of the combination rule, when the factors were subject to different minima.

The rate from Acme to Auburndale, Fla., treated in the formal case cited in the preceding paragraph, was made the subject of discussion in the light of a tariff situation which arose on January 15, 1928, and which this report said, was not given recognition in the report in that case. The decision in that case was overruled in this one to the extent necessary to give effect to the tariff change which came into effect on January 15, 1928.

The rate from Acme to Avera, Ga., was found to have been 46 c., from Acme to Barbourville, Ky., 53 c., as claimed by the railroads, and not 48 c. as claimed by the shippers; Acme to Flemingsburg, Ky., 50.5 c. and not 56.5, as claimed by the railroads, nor 45.5, as claimed by the shippers; Acme to Garrett, Ky., 52.5 c., and not 50, as contended by the shippers; Acme to Olive Hill, Ky., 49 c., and not 44 c., as claimed by the shippers; and Akron, N. Y., to Washington, N. C., 40.5 c., a rate to which all parties agreed as having been brought into effect on July 15, 1928. That situation brought into use a basing rate of 20 c. from Akron, N. Y., to Richmond, Va., to be used in making rates to North Carolina points.

In view of the fact that the entire structure of plasterboard rates in the southeast was under consideration in I. and S. 3615, the Commission said that its decision in this case was without prejudice to any conclusion that might be reached in that case.

Commissioner Lewis dissented from the conclusions reached by the majority in connection with what he said was the principal question presented for decision, namely, the application of the 3.5-c. differential, plasterboard over wall plaster, when shipments moved on combination rates. In that dissent he was joined by Commissioners Meyer, Tate and Mahaffie.

Plaster rates, he said, were published, in all cases, in stated amounts. From origins west of the Mississippi to the Mississippi river crossings, he said, the plasterboard rates were published in the same way. East of the river, by appropriate tariff reference, he added, the board rates were to be determined by adding 3.5 c. to the plaster rates. The plaster rates were subject, he added, to the combination rule, whereas the board rates were not.

The tariff limitation as to the application of the differential, he said, was not brought to the attention of division 5, of which he was a member, in Plaster Board from and to Southern Territory, 151 I. C. C. 385, and, therefore, according to his view, that decision, upon which the majority relied in this case, was erroneous and should be overruled.—*Traffic World.*

Will Fight Proposed Change in Limestone Freight Rates

ACTION has been taken to defend the state of Virginia against new efforts to change the interstate freight rates on ground limestone, H. E. Ketner, commerce counsel for the state corporation commission, said December 6.

The new case involving limestone rates was brought before the Interstate Commerce Commission by the American Limestone Co., a Tennessee corporation which is asking revision of rates out of Mascott, Tenn., to Virginia and other southern points.—*Bristol* (Tenn.) *Herald-Courier.*

Plan Effort to Lower Sand and Gravel Rates

THOMAS H. TATUM, member of the South Carolina state railroad commission, and Z. F. Sloan, the commission's rate expert, recently were in Atlanta to confer with commissioners of other states in preparation for arguments seeking to get lower rates on sand and gravel shipments.

An Interstate Commerce Commission hearing was to be held in Birmingham, Ala., December 10.—*Charlotte* (N. C.) *Observer.*

Foreign Abstracts and Patent Review

Twelve Years of "High-Grade" Cement. Otto Gassner reviews the development made on "high-grade" cement for the last 12 years, giving also 104 references to the literature on the subject, including the names and addresses of manufacturers of the cements. The high-grade portland cement, high-grade iron portland cement and high-grade blast furnace cement are distinguished as compared to portland, iron portland and blast furnace cement primarily by their high initial strength.—*Zement* (1931) **20,** 19, pp. 432-436.

Effect of Carbonic Acid and Acetic Acid on Portland Cement. Hans Th. Bucherer and F. W. Meier, when investigating quantitative determination of cement by means of the filtration method, became interested in determining if there was a possibility of removing lime and magnesia from cement without affecting the silicic acid, so as to avoid the known difficulties which counteract the quantitative elimination of the silicic acid in the presence of greater quantities of lime (and magnesia).

By addition of CO_2 to a hydrous suspension of fresh cement, lime in the form of bicarbonate was removed from the cement (corresponding to its solubility in hydrous CO_2), but at the same time considerable quantities (an average of 24%) of silicic acid enter in solution. Carbonic acid was therefore unsuitable for the purpose.

When using a 1% solution of acetic acid, an average of 15% of the silicic acid present went into solution. Ammonium acetate in place of acetic acid resulted in as much as 8% of soluble silicic acid. The same method was used on alumina cements, in which only a very weak alkaline reaction occurred. When using carbonic acid and acetic acid, or ammonium acetate, iron and alumina were dissolved besides the silicic acid. A complete separation of lime and silicic acid could not be effected.—*Zement* (1930) **19,** 48, pp. 1134-1138.

Stationary Cooler for Rotary Cement Kilns. Upon the suggestion of Stehmann, the movable cooling drum on rotary cement kilns has been replaced with a stationary shaft cooler and funnel cooler. In this cooling method the hot clinker drops into funnels or receiving tanks which have been attached below the kiln outlet. This stationary cooler is being made by a number of manufacturers, and Fig. 1 shows the funnel cooler of the Humboldt-Deutz Motor Co. The hot clinker drops to a receiving apparatus which consists primarily of a funnel-shaped body in which a cascade-like cone-shaped cast-steel arrangement is provided. Cold air is forced into the cooler in counterflow direction to the clinker, which comes in direct contact with the clinker and thoroughly withdraws its heat.—*Zement* (1931) **20,** 19, 453-463 (article on "German Cement Machine Industry in the World Market").

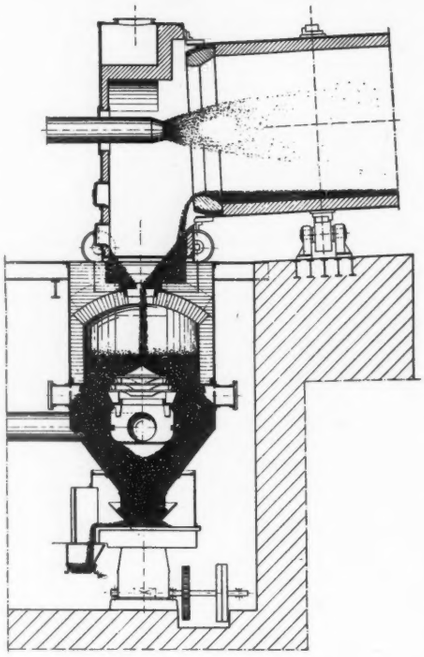


Fig. 1. Section of the Humboldt-Deutz Clinker Cooler

Heat Management of Sand-Lime Products Plant. W. Raiss states that in order to establish a basis for the evaluation of the heat management of steam plants in the sand-lime products industry, the German Reich Association of Sand-Lime Plants started investigations in two plants in 1922 upon which a report was made in 1924. Since then the steam and power plant of plant No. 1 of the report was completely rebuilt and investigated again, the results of which investigation are presented here, this being a comparison of the conditions of operation before and after rebuilding. The change in operation permitted savings in various directions due to a proper distribution of the boiler load, better utilization of the presses, adjustment of pressure in hardening boilers to steam demands on the boiler plant, changing from exhaust to condensing operation. Further improvements in heat management are recommended, such as feed-water preheating; higher superheat temperature; storage of exhaust heat of hardening boilers in feed-water accumulators, increasing steam pressure to permit using the heating steam first for power generation, that is, coupling of power and heating service, this being possible by use of a high-pressure bleeding machine or by installing a high-pressure cylinder ahead of the existing condensing machine; installation of constant or variable-pressure accumulators to absorb fluctuations in operation of boiler plant, hardening boilers, pressures and other plant units.—*Tonindustrie-Zeitung* (1931) **55,** Nos. 35, 36, 38.

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

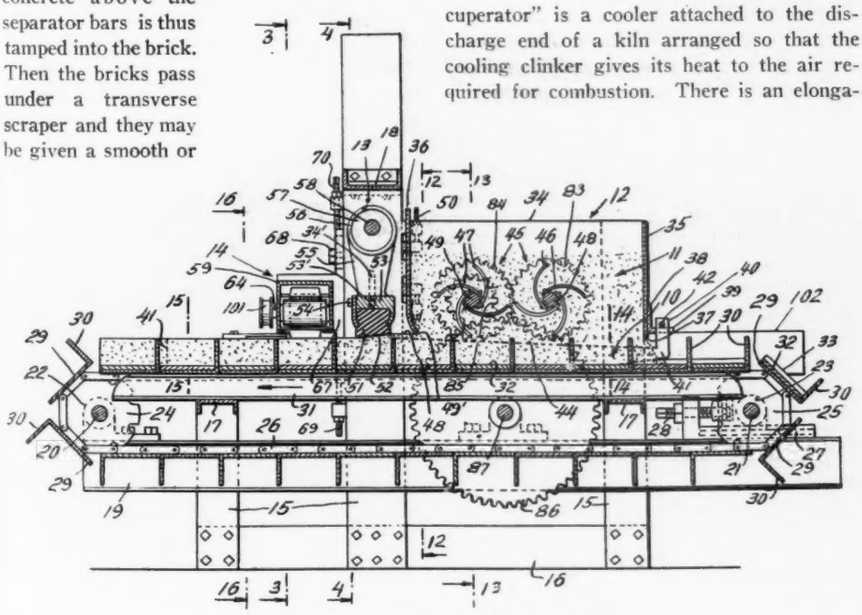
Portland Cement Modifying Composition. The specifications of this patent say that pigments may be mixed with calcium chloride so that the mixture will not deliquesce objectionably in a working day and so that they may be packed in metal containers with tight friction covers. The inventor believes that the effect of thus adding a colloidal material takes up the moisture so that the calcium chloride is not so much affected. Various ferric oxides, carbon black, lamp black, manganese dioxide and para-nitraniline are mentioned. In general any color which is alkali resisting may be so used. The inventor says that he prefers to use such colors as will increase the strength of portland cement.

In addition, the inventor says that he may add other ingredients for special purposes, such as barium chloride, to increase the density of the concrete. Normally, it is stated, barium chloride reacts with the calcium sulphate found in normal portland cement forming barium sulphate which fills the pores. About 5% is an average figure for the barium chloride. An example of a mix is 60 lb. bright red ferric oxide, containing 75% Fe_2O_3, mixed with 30 lb. granulated calcium chloride, 5 lb. barium chloride and 5 lb. aluminum silicate heated to dehydrate in a steam-jacketed kettle at any temperature above 212 deg. F. This is packed in 10-lb. containers, each being sufficient to treat 100 lb. portland cement, giving a red cement, to waterproof, accelerate and harden the product.—*Maxmillian Toch, assignor to Standard Varnish Works, New York, N. Y., U. S. Patent No.* 1,793,143.

Refractory Cement. A cement which is approximately of the same composition as the refractory brick with which it is to be used has been patented. The specification describes it as made of silica, but says that other oxides such as Al_2O_3, Zr_2O_3 and MgO may be used. An example mentioned is made of natural or artificial colloidal silica 5%, diatomaceous silica 10% and ground quartzite 85%. The colloidal silica gives the

cementing quality. This is said to mature into a binding medium at about 1450 deg. C. The maturing point may be raised or lowered by varying the proportions. Eliminating the diatomaceous silica or lowering the colloidal raises the point and increasing the colloidal and diatomaceous silica lowers it; it may be, too, as low as 1000 deg. C. The proportions are adjusted so that the bonding temperature is a little above the temperature which the lining must stand while it is in use. When the bricks are laid with this cement the kiln or whatever else is lined is brought up to the bonding temperature. Since the cement and the bricks used have nearly the same chemical composition, the result is a substantially monolithic lining. Although the specifications mention the use of other oxides than silica, the single claim asks only protection for a cement made of dry pulverulent materials as given above and in the proportions stated above.—*Trevor M. Caven, U. S. Patent No.* 1,791,591.

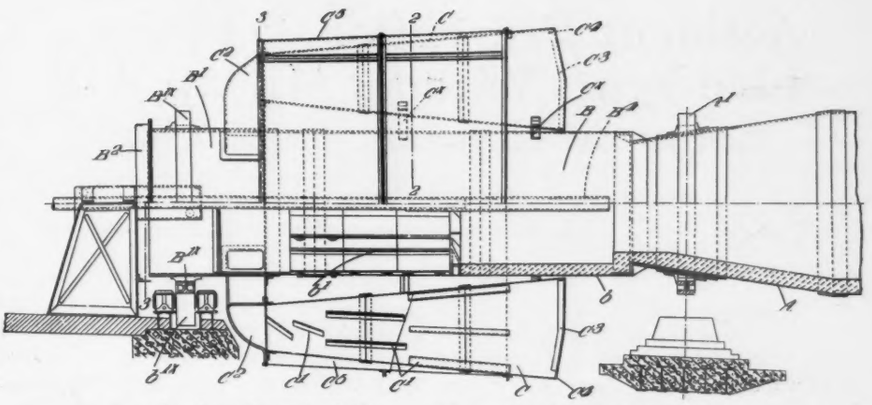
Concrete Brick Manufacture. Pallet holders with upstanding backs are carried on an endless chain. The pallets placed on them and the upstanding backs form the mold. The backs have slots through which separator bars pass. The width of a pallet is the length of a brick and the length is the width of a plurality of bricks placed side by side, the number depending on the width of the machine. The holders with the pallets are passed under a hopper filled with concrete in which are revolving steel blades that keep it from bridging and force it on to the pallets. The separator bars slant at the top. This is so the concrete goes on the pallet almost as a solid mass, which is cut into brick size by the separator bars as the pallets move ahead. After coming out from under the hopper the pallets pass under a tamper with a rubber head which tamps the concrete down to brick thickness. A surplus of concrete above the separator bars is thus tamped into the brick. Then the bricks pass under a transverse scraper and they may be given a smooth or a tapestry finish by the way the scraper is applied. The pallet with the finished brick is removed by hand.—*Charles Dietrichs, assignor to Walker Cement Products Co., Union City, N. J., U. S. Patent No.* 1,782,413.



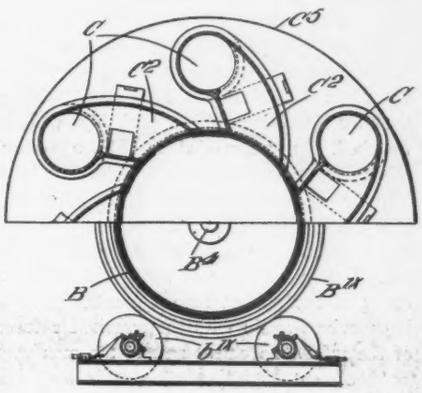
Section through concrete brick machine

Process of Treating Barytes. The known process of treating barytes consists in boiling in hot, strong sulphuric acid and washing out the iron salts formed as far as possible. There is always a residue of ferric salts from the oxidizing of the ferrous salts by the oxygen of the air and dissolved in water, and some free sulphuric acid is left. These cannot be washed out commercially and attempts to neutralize with ammonia give the product a yellow color. The inventor claims that by passing sulphur fumes into the wash water he can make sulphurous acid which will prevent the iron from oxidizing. It will leave nothing in the barytes but sulphurous acid which will be wholly driven off in the heat of the drying process.—*Casper P. De Lore and Brack B. McHan, Lore assigning to McHan, U. S. Patent No.* 1,783,778.

Cooling Clinker and Preheating Air. What the inventor describes as a "heat recuperator" is a cooler attached to the discharge end of a kiln arranged so that the cooling clinker gives its heat to the air required for combustion. There is an elongation to the kiln into which the clinker flows. At the far end are openings through which the clinker passes into conduits set around the elongation of the kiln. They are placed so that the hot clinker flows through them in the reverse of the direction of flow through the kiln. Angle iron lifters are placed so that the clinker is cascaded through the air which enters these conduits and passes into the kiln.—*Lionel Douglas Parker, Barrow-in-Furness, England, assignor to Vickers, Ltd., London, U. S. Patent No.* 1,791,282.



Section through clinker cooling and air preheating unit



Transverse section of cooling unit

Method of Improving the Properties of Portland Cement. The inventor claims that by adding 3% of calcium sulphide to portland cement he can make a non-hygroscopic compound which will have greater tensile and compressive strength than the portland alone at all ages and will harden more rapidly. He gives as results of tests: Portland alone, 28 d. 420; with 1% CaS, 567, and with 5% CaS, 603, all in kg./cm. Added to quick-hardening cement, the results were: Portland alone, 3 d. 351; with 1% CaS, 415; with 5% Cas, 470, all in kg./cm. The advantage claimed over calcium chloride added to cement is that the cement mixed with calcium sulphide may be handled and stored without becoming lumpy and moist.—*Emil Reubke, assignor to I. G. Farbendindustrie Aktiengesellschaft, Frankfort O. M., Germany, U. S. Patent No.* 1,791,684.

Accident Prevention Progress—Five Years Without Mishap Will Soon Be Cement Plant Goal

By J. B. John

Chairman, Committee on Accident Prevention, Portland Cement Association

TWO American Cement plants—one of them operating a large quarry and the other a hazardous limestone mine—have completed periods of more than five consecutive years without accident. Three or four more have completed more than three years. Safe operating records by mill departments over extended periods are mounting rapidly, while enthusiasm on the part of the employes continues on the increase.

Small wonder that accident prevention in the cement mills and quarries has passed the stage where it is of interest merely to our own industry. A record of nearly 2000 days operation of a cement plant without an injury to an employe serious enough to require a lay-off may be made a valuable object lesson to the workers of any industry. The record of 46 mills which operated without accident in 1930, which probably will be matched, if not exceeded, in 1931, offers another illustration that would be hard to beat. Twenty-eight additional plants have suffered but one accident this year—many of them rising rapidly from the bottom of the safety list. Next year many of these will swell the ranks of the perfect record plants, impressing workers again with the irresistible force of the safety movement among the men who make cement.

Accident experience in the cement industry during the last few months was the subject of unusual interest at the recent meeting of the committee on accident prevention of the Portland Cement Association. While we have been unable as yet to estimate the reduction this year in the number of men at work, the man-hours of accident exposure, or the quantity of cement produced in reporting mills, the shrinkage in accident frequency has been far greater than could be reasonably accounted for through the scaling down of operations. Considerable hazard has been added by necessary "doubling up" on certain jobs and extending the responsibility of both workmen and those employed in supervisory capacities.

It is in times such as the present, when men are required to do the unusual and the trend is to economize on repairs, renewals and emergency equipment of various kinds, that the principles and methods followed in accident prevention work are put to the test. The organized safety work of the cement industry has centered around teaching men to think safely as a matter of habit; far less attention has been paid to formulating rules governing specific detail duties. Recent results would seem to demonstrate again that we are on the right track.

During the first nine months of 1931, 138 plants reported 173 lost-time and 14 fatal accidents. Figures received from 146 plants for the corresponding period of 1930 showed 336 lost-time and 14 fatal accidents. With

J. B. John

eight fewer plants reporting there has been a reduction of 46½% in the total number of reportable mishaps for this period.

So we expect, during the coming year, to continue safety work among the cement mills along the lines that have proved so well adapted and successful during the last few years. But we also have in addition some excellent new suggestions which have come to us recently through some of our alert operating officials.

Improving in record and gathering added enthusiam, as we go along, there is no reason to doubt that five-year safe records may soon replace in our interest the one-year records which only a few years ago appeared to us as beyond the range of possibility. If you doubt, look over accident frequency totals in the member plants of the Portland Cement Association for a few years. Five-year records are not only possible but they are here!

During 1931 there probably will be less than 260 lost-time accidents recorded. In 1925 there were over 2600. Two mills were gazed upon with wonder or suspicion as they substantiated their claims to no-accident records of one year, in 1926; more than a third of the operating plants worked without accident in 1930 and the proportion will be larger this year.

So I believe that we are entering the era of five-year safe records. And if the 40,000 men who operate these great mills—you who "know your safety" so well—will join hands on that, we will travel together to a new height and become the stronger, the better and the happier for our effort.

November Accidents in the Cement Mills

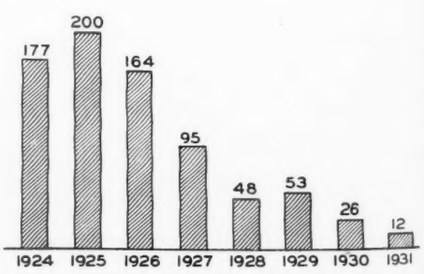
DURING November cement plants represented in the membership of the Portland Cement Association reported a total of 12 accidents involving personal injury to employes. Ten of these caused only loss of employes' time; one resulted in a permanent partial disability and one in death. During the preceding month 20 lost time accidents and one fatality were reported. The record for November, 1930, included 26 lost time accidents with no fatals.

The fatal accident which occurred last month took the life of an employe of a coal grinding department who became entangled in a windlass rope, used to move coal cars into position for dumping. He was drawn between the rope and the capstan causing fatal injuries.

In another accident a raw mill laborer engaged in cleaning discharge spout to a stone dryer elevator, caught his hand in the machinery. Resulting injuries necessitated amputation of fourth finger.

A laborer employed in the yard gang was placing chain around motor preparatory to lifting with the steam shovel. When the shovel lifted, the employe's fingers became caught between the chain and the motor. The hand was painfully injured, with loss of four days' time.

Probably the most spectacular accident of the month occurred when the bridge structure of a coal unloading dock suddenly collapsed. Two employes at work in the machinery room on the structure were severely injured. One received a compound fracture of the hip bone, burns about the feet and knees and cuts and contusions about the head. The other received contusions to shoulders and hip and was in a general state of shock.



Comparison of November accidents

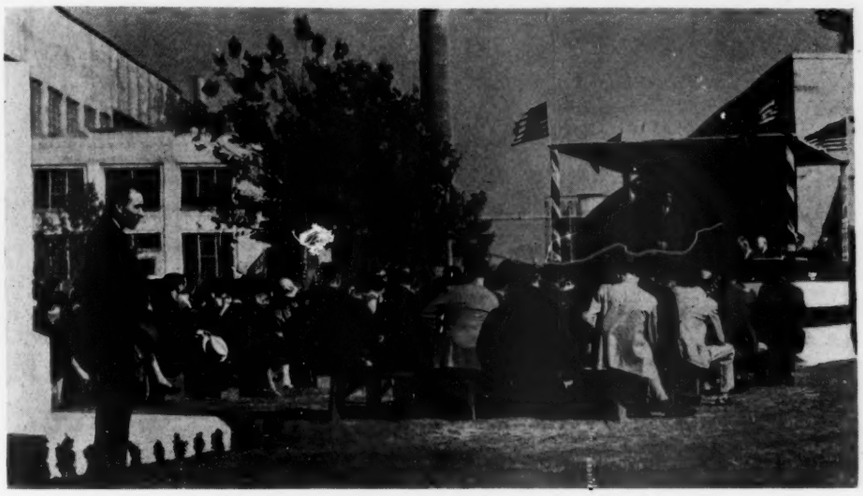
Alpha Birmingham Plant Celebrates

Last Scheduled Trophy Dedication of the Season

THE LAST of the 43 celebrations commemorating the winning of the Portland Cement Association safety trophy last year by 46 mills took place at the Birmingham, Ala., plant of the Alpha Portland Cement Co. November 14.

H. O. Underhill, southern manager of the Alpha company, acted as chairman of the exercises and was ably assisted with the arrangements by the plant safety committee, which has been actively working for a number of years to secure the perfect safety record which carried with it the coveted award. their serious cooperation with the safety movement.

President Brown's appearance was unusually interesting. He had traveled several hundred miles in order, as he said, to be present with his men on the day set apart for rejoicing over their great record for safety. Very few such occasions at the plants of his company have been missed by Mr. Brown in the last five years. The record achieved by seven of the 10 Alpha plants in being able to complete 1930 without an accident serious enough to cost the loss of



President Brown addressing the meeting

The occasion brought to Birmingham a distinguished company of Alpha officials, including President G. S. Brown, Vice-President F. G. McKelvy and Safety Director W. W. Hamilton.

The program of ceremonies was as follows:

Invocation—Rev. E. B. Gatlin.

Presentation of the association trophy—Mark H. Small, district engineer, Portland Cement Association.

Unveiling of the trophy—Misses Carolyn Breaux and Marjorie Brown, daughters of safety committee members.

Acceptance of the trophy—G. D. Yonell, general foreman and chairman, safety committee.

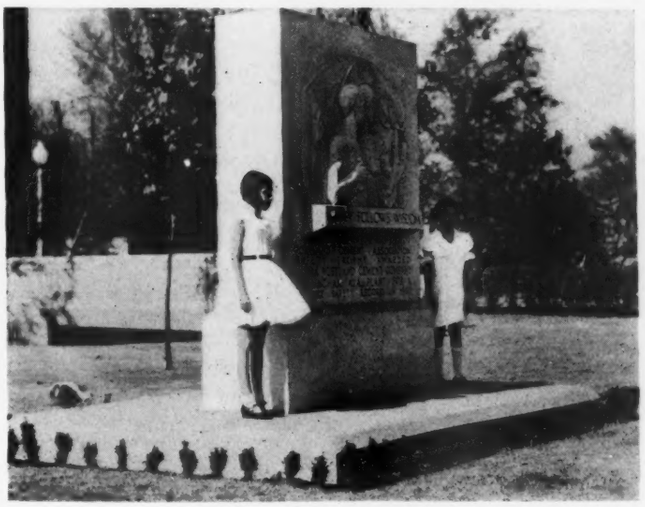
Address—G. S. Brown, president, Alpha Portland Cement Co.

Address—Hugh Morrow, president, Sloss-Sheffield Steel and Iron Co.

Benediction—Rev. E. B. Gatlin.

Employes, their families and friends, as well as distinguished and interested citizens, comprised an audience of several hundred which greeted the speakers. With the presentation of the handsome cast stone monument to the Alpha mill, all three cement plants in the immediate vicinity of Birmingham have trophies, eloquent testimony to the progressive spirit of the southern plants and a day's time was greatly pleasing to Mr. Brown and his listeners alike.

During the ceremonies it was announced that the Alpha plant at Ironton, Ohio, had completed five years without a lost-time accident, the second longest record in the entire industry.



Unveiling of monument

Marquette Celebrates Safety Record

EMPLOYES and officials of the Marquette Cement Manufacturing Co., celebrated the completion of three years at the Cape Girardeau, Mo., plant without a single lost-time accident on November 24. The celebration, held in the ground floor auditorium of the First Baptist church and attended by approximately 500 persons, was also the occasion for presentation of the bronze trophy given in recognition of the record by the National Crushed Stone Association and the *Explosives Engineer.*

Presentation of the trophy was made by W. R. Sanborn, Kankakee, Ill., vice-president of the National Crushed Stone Association, and was accepted by E. M. Gould, quarry superintendent at the local plant.

Dr. M. N. Waldrip, pastor of Centenary Methodist church, delivered the principal address.

H. O. Cole, manager of the Cape Girardeau plant, was chairman of the meeting and the program was interspersed with numbers played by the Marquette employes band. Rev. E. D. Owen delivered the invocation, and R. C. Matthews, who has seen 22 years of service in the cement industry and is now local plant superintendent, gave the welcome address.

V. J. Hanley of Chicago, brought a message from officials of the company's main office and urged the local employes to strive to an even greater record than the one now held. A message from the LaSalle, Ill., plant was brought by J. J. Kelly, manager of industrial relations for the company.

M. P. ("Safety") Greer, safety engineer at the Cape Girardeau plant, explained the safety record established by the plant. In the cement mill the employes worked for three years and two months without a lost-time accident, and in the quarry a four-year record will be established December 24 of this year. At the time of the celebration this department had 1430 days without accident having been charged to it.

Talks were also made by Elmer Heise, safety engineer of the Columbia Quarry Co., Columbia, Ill., who told that his quarrymen had now gone through 15 months without an accident as a result of adopting safety measures similar to those used in this plant. R. Klaus, superintendent of the company, also made a brief talk.—*Cape Girardeau* (Mo.) *Missourian.*

Official Tabulation of Cement Bids for 1932 Highway Construction by State of Wisconsin, Received by Wisconsin Highway Commission, November 28, 1931

Destination	Number bbl. required at destination	Universal Atlas Cement Co. Bid bbl.	Marquette Cement Mfg. Co. Bid bbl.	Lehigh Portland Cement Co. Bid bbl.	Medusa Portland Cement Co. Bid bbl.	Alpha Portland Cement Co. Bid bbl.	Manitowoc Portland Cement Co. Bid bbl.	Petoskey Portland Cement Co. Bid bbl.	N.W. States Portland Cement Co. Bid bbl.	Dewey Portland Cement Co. Bid bbl.	Huron Portland Cement Co. Bid bbl.	Lone Star Cement Co. Bid bbl.
Algoma	15,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....	1.51	1.51	.....
Aniwa	23,000	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	.....
Auburndale	2,500	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	.....
Beaver	33,000	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....	1.53	1.53	.....
Beloit	22,500	1.40	1.40	1.40	1.40	1.40	1.40	.....	.....	1.40	1.40	.....
Benton	750	1.42	1.42	1.42	1.42	1.42	1.42	.....	.....	1.42	.....	.....
Berlin	15,350	1.50	1.50	1.50	1.50	1.50	1.50	1.50	.....	1.50	1.50	1.50
Bowler	24,000	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55
Brown Deer	33,000	1.39	1.39	1.39	.....	1.39	1.39	1.39	.....	1.39	1.39	.....
Brule	17,100	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	.....
Buffalo	10,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
Burlington	4,300	1.36	1.36	1.36	1.36	1.36	1.36	.....	.....	1.36	1.36	.....
Butler	4,100	1.27	1.27	1.27	.....	1.27	1.27	.....	.....	1.37	1.27	.....
Cassian	1,000	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61
Camp Douglas	18,500	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Cedar Grove	20,500	1.44	1.44	1.44	1.44	1.44	1.44	1.44	.....	1.44	1.44	.....
Chippewa Falls	20,650	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....
Cleveland	350	1.42	1.43	1.42	1.42	1.42	1.42	1.42	.....	1.42	1.43	.....
Clinton	13,000	1.38	1.38	1.38	1.38	1.38	1.38	.....	.....	1.38	1.38	.....
Columbus	675	1.46	1.46	1.46	1.46	1.46	1.46	1.46	.....	1.46	1.46	.....
Denmark	400	1.42	1.43	1.42	1.42	1.42	1.42	1.42	.....	1.42	.....	.....
De Pere	11,000	1.45	1.45	1.45	1.45	1.45	1.45	1.45	.....	1.45	1.45	.....
Durand	490	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Edgerton	5,100	1.44	1.44	1.44	1.44	1.44	1.44	.....	1.44	1.44	1.44	.....
Ellsworth	1,215	1.49	1.49	1.49	1.49	1.49	1.49	.....	1.49	1.49	.....	.....
Fifield	21,300	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	.....
Fond du Lac	12,000	1.46	1.46	1.46	1.46	1.46	1.46	1.46	.....	1.46	1.46	.....
Forestville	25,000	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....	1.53	1.53	.....
Frederic	6,100	1.51	1.51	1.51	1.51	1.51	1.51	.....	1.51	1.51	1.51	.....
Gilman	782	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	.....
Grantsburg	500	1.51	1.51	1.51	1.51	1.51	1.51	.....	1.51	1.51	1.51	.....
Haugen	25,500	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....
Heafford Jct.	1,300	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61
Humbird	23,875	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	.....
Hurley	1,700	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	.....
Iron River	5,000	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	.....
Jump River	621	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	.....
Kendall	2,800	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
La Crosse	4,852	1.46	1.46	1.46	1.46	1.46	1.46	.....	1.46	1.46	.....	.....
Ladysmith	2,700	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	.....
Lake Mills	18,000	1.44	1.44	1.44	1.44	1.44	1.44	.....	.....	1.44	1.44	.....
La Valle	14,700	1.49	1.49	1.49	1.49	1.49	1.49	.....	1.49	1.49	1.49	1.49
London	2,300	1.44	1.44	1.44	1.44	1.44	1.44	.....	.....	1.44	1.44	.....
Madison	7,100	1.44	1.44	1.44	1.44	1.44	1.44	.....	1.44	1.44	1.44	.....
Maple	10,000	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	.....
Mazomanie	500	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	1.46	.....
Merrillan	13,700	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Middle River	300	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	.....
Millston	32,700	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Muskego	5,000	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	.....
Nelson	10,000	1.48	1.48	1.48	1.48	1.48	1.48	.....	1.48	1.48	.....	.....
New Lisbon	10,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
North Fond du Lac	12,000	1.46	1.46	1.46	1.46	1.46	1.46	1.46	.....	1.46	1.46	.....
North Tomah	17,900	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Norwalk	1,500	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Ojibwa	620	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	.....
Omro	5,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Onalaska	5,400	1.46	1.46	1.46	1.46	1.46	1.46	.....	1.46	1.46	.....	.....
Oshkosh	16,000	1.47	1.47	1.47	1.47	1.47	1.47	1.47	.....	1.47	1.47	.....
Packwaukee	5,000	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
Pardeeville	750	1.48	1.48	1.48	1.48	1.48	1.48	1.48	.....	1.48	1.48	1.48
Pelican	23,350	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.51	1.59
Pepin	11,000	1.48	1.48	1.48	1.48	1.48	1.48	.....	1.48	1.48	.....	.....
Phillips	25,000	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	.....
Pittsville	350	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....
Plymouth	3,300	1.44	1.44	1.44	1.44	1.44	1.44	1.44	.....	1.44	1.44	.....
Poplar	10,000	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	.....
Portage	700	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48
Pound	20,000	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....	1.53	1.53	1.53
Random Lake	20,000	1.44	1.44	1.44	1.44	1.44	1.44	1.44	.....	1.44	1.44	.....
Readstown	960	1.47	1.47	1.47	1.47	1.47	1.47	.....	1.47	1.47	.....	.....
Red Granite	15,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
Rhinelander	17,100	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61
Rice Lake	10,000	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....
Sarona	15,500	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....
Sauk City	750	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	.....
Sherwood	36,000	1.45	1.45	1.45	1.45	1.45	1.45	1.45	.....	1.45	1.45	.....
Solon Springs	800	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	1.55	.....
Somerset	1,500	1.48	1.48	1.48	1.48	1.48	1.48	.....	1.48	1.48	1.48	.....
Sparta	1,500	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	1.48	.....
Spooner	15,400	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....
Stiles Jct.	53,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Sturgeon Bay	41,000	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....	1.53	1.53	.....
Thornton	12,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Trevino	10,200	1.48	1.48	1.48	1.48	1.48	1.48	.....	1.48	1.48	.....	.....
Tuscobia	10,000	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	1.53	.....
Union Center	2,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	.....
Victory	650	1.47	1.47	1.47	1.47	1.47	1.47	.....	1.47	1.47	.....	.....
Waukau	34,000	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51	1.51
Wauwautosa	4,100	1.10	1.00	1.15	.....	1.18	1.00	.....	.....	.....	1.10	.....
Wentworth	12,000	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59	.....
West Allis	19,500	1.10	1.00	1.15	.....	1.18	1.00	.....	.....	.....	1.10	.....
Weyauwega	9,500	1.51	1.51	1.51	1.51	1.51	1.51	.....	1.51	1.51	1.51	.....
Wheeler	471	1.53	1.53	1.53	1.53	1.53	1.53	.....	1.53	1.53	1.53	.....
Wittenberg	20,000	1.55	1.55	1.55	1.55	1.55	1.55	.....	1.55	1.55	1.55	1.55
	1,078,611											

NOTE: Deduct 10c per bbl. cash discount for net in bulk. Add 25c per bbl. to net bulk price for paper bags. Add 50c per bbl. to net bulk price for cloth sacks.

Award 1932 Cement Contracts in Wisconsin

(See official tabulation on page opposite)

CONTRACTS for 1,150,000 bbl. of cement for the 1932 construction program were awarded December 3 by the Wisconsin state highway commission.

The commission explained that it was placing its orders along with those of other states five months in advance of the usual purchase period to assist in stabilizing the cement industry.

Total contract awards included the following companies: Manitowoc Portland Cement Co., 425,000 bbl.; Marquette Cement Manufacturing Co., 200,000 bbl.; Petoskey Portland Cement Co., 150,000 bbl.; Lehigh Portland Cement Co., 125,000 bbl.; Universal Atlas Cement Co., 100,000 bbl.; Alpha Portland Cement Co., 50,000 bbl.; Huron Portland Cement Co., Lone Star Cement Co., Dewey Portland Cement Co., and Northwestern States Portland Cement Co., 25,000 bbl. each.

These orders total more than 5750 carloads, the commission explained, and will provide 577,300 man hours of work in the industry.

Any increase or reduction within a 25% limit will be distributed among the 10 companies in proportion to these allotments, but new bids will be asked for amounts in excess of 25% increase.—*Milwaukee* (Wis.) *Journal.*

Indiana Awards Contracts for 1932 Cement Requirements

CONTRACTS for 237,000 bbl. of cement were awarded to 12 bidders December 3 by the Indiana state highway commission. Prices ranged from $1.16 to $1.28 a bbl. to the point nearest the destination of construction work. The cement will be used on 1932 projects of the highway commission.

The highway commission remains undecided as to whether it will change the system of cement bidding, by awarding projects to the contractor with the provision the contractors would provide the cement rather than the state buy it, it was said. The commission also announced it would receive bids on 2,000,000 bbl. of cement December 17, the contracts containing the provision the state could reject all bids.

The bids were awarded following a conference of the highway commission with Governor Leslie at which time the Governor asked the commission not to be too hasty in reaching its decision as to the changing of its awarding contracts for road and bridge projects.

Bids were awarded the following companies: Alpha Portland Cement Co., 5000 bbl.; Consolidated Cement Co., 10,000 bbl.; Kosmos Portland Cement Corp., 5000 bbl.; Lehigh Portland Cement Co., 33,000 bbl.; Lone Star Cement Co., 33,000 bbl.; Louisville Cement Co., 33,000 bbl.; Marquette Cement Manufacturing Co., 10,000 bbl.; Medusa Portland Cement Co., 15,000 bbl.; Pittsburgh Plate Glass Co., 12,000 bbl.; Southwestern Portland Cement Co., 15,000 bbl.; Universal Cement Co., 33,000 bbl., and the Wabash Portland Cement Co., 33,000 bbl.—*Indianapolis* (Ind.) *News.*

Iowa Awards 1932 Cement Contracts

ANNOUNCEMENT that Des Moines, Ia., cement plants have been awarded half the million-barrel 1932 cement contract let by the Iowa state highway commission was made recently.

The Hawkeye Portland Cement Co. will furnish 300,000 bbl., while the Pennsylvania-Dixie Cement Corp. will furnish 200,000 bbl.

Both plants use Iowa coal.

Officials of the two Des Moines cement plants said the highway contract will mean longer runs for next year.

Of the remainder of the Iowa contract, 150,000 bbl. were awarded to out of state plants, and the other 350,000 was divided between the Northwestern States Portland Cement Co., Lehigh Portland Cement Co., and Dewey Portland Cement Co.—*Des Moines* (Ia.) *Tribune Capital.*

Raising Dredge That Sunk in Gravel Pit

PROGRESS is being made in the work of raising for repairs the steel dredge boat that sank in 40 ft. of water in the gravel pit of the Kickapoo Sand and Gravel Co., west of Peru, Ind., several weeks ago.

The boat has not been completely raised, but has been brought to a point near the edge of the pit, preparatory to towing it to the edge of the bank.

Some difficulty has been encountered by the breaking of cables, due to the tremendous weight of the boat.

The dredge is of two-deck construction and with dynamos and other equipment cost about $25,000. The cause of the sinking has not been definitely determined, although it is believed that the hole ripped in the side of the boat was caused when lightning struck it.—*Peru* (Ind.) *Tribune.*

Milwaukee Awards 1932 Cement Contract

THE Milwaukee, Wis., city purchasing board recently awarded a contract for 20,000 bbl. of cement at $1.09 per bbl. to be delivered in 1932. The contract was given to the Schneider Fuel and Supply Co., Milwaukee, as result of an agreement that at least 25% of the cement must be from a Wisconsin manufacturer while the remaining 75% must come from companies having storage plants in Wisconsin.—*Milwaukee* (Wis.) *Wisconsin News.*

Open Bids on Cement for 1932 in South Carolina

ELEVEN cement companies recently submitted bids to the South Carolina highway department for supplying it with portland cement during 1932.

The bids of the 11 concerns were identical.

The first bid opened provided the furnishing of cement in the western division at $2.24 the bbl., the cement to be in carload lots and in cloth bags. All the ten other bidders submitted identical figures.

The bid for furnishing the central division was $2.28 per bbl. The figures for the 11 bidders were the same.

For the southeastern division, the bid was $2.36 per bbl. Again the 11 bidders submitted the same figures.

The prices are for cement delivered at the points named.

No contract was entered into as a result of the bid opening and the entire matter may be further discussed at a meeting of the highway commission.

The prices submitted for 1932 were the same prices at which the department is now purchasing cement, according to Robert King, superintendent of purchase.

It was estimated by the department that 300,000 bbl. of cement would be used in 1932 in each of the four divisions.

"The fact that all the cement firms bidding offered to supply the state at identical figures means that competition is free and unhampered," one cement man said when asked how it was that 11 concerns submitted the same figures.

"Cement companies keep closely in touch with prices at which their competitors are furnishing cement to firms or commonwealths, and the fact that all submitted the same figures does not mean a combination or previous agreement as to prices.

"I have heard it illustrated this way," he said. "Take two glass tubes; stand them upright and connect them with a soft rubber tube. Fill one with water and if passage through the tube is free and unhampered, the water will rise to the same level in both tubes. If the passage through the tube is hampered, water in one tube may be higher than in the other. Equal prices submitted means free and unhampered competition."

The 11 firms submitting bids were:

Universal Atlas Cement Co., Lehigh Portland Cement Co., National Cement Co., Carolina-Portland Cement Co., Volunteer Portland Cement Co., Lone Star Cement Co. of Alabama, Signal Mountain Portland Cement Co., Penn-Dixie Cement Corp., Hermitage Portland Cement Co., Cumberland Portland Cement Co. and the Alpha Portland Cement Co.—*Columbia* (S. C.) *State.*

Portland Cement Production for November

THE PORTLAND CEMENT INDUSTRY in November, 1931, produced 8,161,000 bbl., shipped 7,156,000 bbl. from the mills and had in stock at the end of the month 22,223,000 bbl. Production of portland cement in November, 1931, showed a decrease of 26.5% and shipments a decrease of 18.5%, as compared with November, 1930. Portland cement stocks at the mills were 3.6% lower than a year ago.

The statistics here presented are compiled from reports for November, received by the Bureau of Mines, from all manufacturing plants except three, for which estimates have been included in lieu of actual returns.

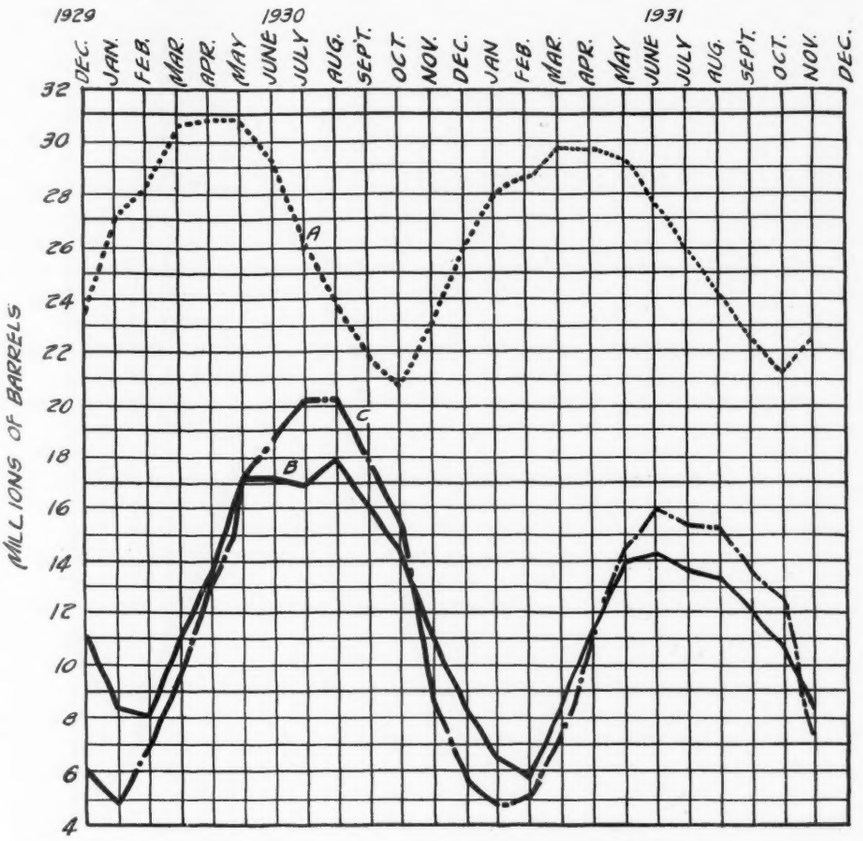
In the following statement of relation of production to capacity the total output of finished cement is compared with the estimated capacity of 165 plants at the close of November, 1931, and of November, 1930. The estimates include increased capacity due to extensions and improvements during the period.

RELATION OF PRODUCTION TO CAPACITY

	Nov. 1930 Pct.	Nov. 1931 Pct.	Oct. 1931 Pct.	Sept. 1931 Pct.	Aug. 1931 Pct.
The month	51.7	37.2	47.4	55.3	60.2
12 months ended	62.6	44.4	48.6	50.2	52.0

Distribution of Cement

The following figures show shipments from portland cement mills distributed among the states to which cement was shipped during September and October, 1930 and 1931.


1929
1930
1931
DEC. JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC. JAN FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.
MILLIONS OF BARRELS
32 30 28 26 24 22 20 18 16 14 12 10 8 6 4
A
B
C

(A) Stocks of finished portland cement at factories; (B) Production of finished portland cement; (C) Shipments of finished portland cement from factories

PORTLAND CEMENT SHIPPED FROM MILLS INTO STATES IN SEPTEMBER AND OCTOBER, 1930 AND 1931, IN BARRELS*

Shipped to	1930—September	1931	1930—October	1931
Alabama	68,936	60,846	88,358	50,940
Alaska	1,362	835	697	808
Arizona	39,785	33,835	33,524	27,780
Arkansas	150,714	49,943	144,307	40,635
California	836,501	523,744	931,721	580,258
Colorado	82,050	87,979	78,683	86,048
Connecticut	195,962	159,798	153,822	162,540
Delaware	26,704	43,222	20,017	27,187
District of Columbia	137,507	125,178	154,670	122,498
Florida	76,333	51,414	89,354	51,252
Georgia	163,464	164,838	174,340	162,410
Hawaii	16,778	18,544	23,850	21,468
Idaho	46,308	19,173	34,385	15,481
Illinois	1,704,696	975,734	1,586,016	856,580
Indiana	497,163	466,096	321,285	313,599
Iowa	781,608	305,343	317,288	209,676
Kansas	250,548	173,915	226,472	166,235
Kentucky	241,402	173,093	223,805	149,282
Louisiana	163,544	555,155	172,194	485,188
Maine	148,381	59,275	87,454	46,894
Maryland	285,312	206,115	257,617	291,938
Massachusetts	331,061	392,466	376,533	344,866
Michigan	1,018,648	620,928	867,458	461,985
Minnesota	374,833	432,521	237,592	242,908
Mississippi	51,680	33,326	39,377	23,656
Missouri	710,759	424,958	713,573	481,965
Montana	44,217	30,420	27,189	21,927
Nebraska	241,572	264,988	174,005	194,514
Nevada	16,111	12,735	18,751	18,440
New Hampshire	84,449	59,641	48,117	51,874
New Jersey	610,200	599,005	664,381	645,068
New Mexico	28,870	21,342	27,047	25,380
New York	2,515,171	2,316,622	2,063,858	2,096,119
North Carolina	102,658	61,534	101,403	59,103
North Dakota	38,359	19,533	24,513	17,110
Ohio	1,103,327	805,284	1,011,292	749,570
Oklahoma	348,023	140,858	270,430	174,121
Oregon	112,133	88,543	130,953	91,480
Pennsylvania	1,557,564	857,987	1,351,511	781,503
Porto Rico	10,250	4,037	5,000	4,515
Rhode Island	100,664	63,719	76,031	54,139
South Carolina	245,776	186,108	273,208	243,408
South Dakota	86,654	86,660	44,410	29,736
Tennessee	294,910	99,884	271,922	111,024
Texas	573,392	601,256	438,457	542,920
Utah	39,116	26,160	38,549	22,669
Vermont	66,810	49,250	53,087	32,942
Virginia	174,179	151,914	155,410	122,618
Washington	328,595	188,660	324,276	157,064
West Virginia	196,307	†160,286	139,483	142,876
Wisconsin	700,327	474,841	414,797	389,339
Wyoming	20,224	12,405	20,691	10,638
Unspecified	4,888	†105,254	40,039	121,253
	18,046,784	13,647,200	15,563,202	12,335,427
Foreign countries	36,216	23,800	35,798	24,573
Total shipped from cement plants	18,083,000	13,671,000	15,599,000	12,360,000

*Includes estimated distribution of shipments from three plants in September and October, 1931; from two plants in September and October, 1930.
†Revised.

PRODUCTION AND STOCKS OF CLINKER BY MONTHS, IN 1930 AND 1931, IN BARRELS

Month	1930—Production	1931	Stocks at end of month 1930	1931
January	10,504,000	8,129,000	9,646,000	10,384,000
February	10,008,000	7,473,000	11,572,000	11,946,000
March	13,045,000	9,586,000	13,503,000	13,318,000
April	15,025,000	11,540,000	15,164,000	13,854,000
May	16,607,000	13,159,000	14,668,000	13,087,000
June	15,895,000	12,679,000	13,452,000	11,837,000
July	15,069,000	12,246,000	11,684,000	10,209,000
August	15,244,000	11,664,000	9,275,000	8,468,000
September	14,577,000	10,414,000	7,783,000	6,918,000
October	13,895,000	9,825,000	7,266,000	*6,021,000
November	11,639,000	8,259,000	7,758,000	6,212,000
December	9,484,000	.....	8,809,000	.....

*Revised.

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY DISTRICTS, IN NOVEMBER, 1930 AND 1931, AND STOCKS IN OCTOBER, 1931, IN BARRELS

District	Production 1930—Nov.—1931		Shipments 1930—Nov.—1931		Stocks at end of month 1930	1931	Stocks at end of Oct., 1931*
Eastern Penn., N. J., Md.	2,390,000	2,046,000	2,124,000	2,064,000	4,521,000	4,649,000	4,668,000
New York and Maine	924,000	686,000	617,000	661,000	1,395,000	1,185,000	1,159,000
Ohio, Western Penn., W. Va.	1,085,000	769,000	830,000	581,000	3,285,000	3,310,000	3,122,000
Michigan	943,000	385,000	538,000	267,000	2,722,000	2,011,000	1,893,000
Wis., Ill., Ind. and Ky.	1,233,000	894,000	857,000	761,000	2,922,000	2,485,000	2,352,000
Va., Tenn., Ala., Ga., Fla., La.	877,000	733,000	807,000	763,000	1,767,000	1,654,000	1,684,000
East'n Mo., Ia., Minn., S. D.	1,131,000	827,000	739,000	474,000	1,934,000	2,725,000	2,372,000
West'n Mo., Neb., Kansas, Okla. and Ark.	743,000	566,000	632,000	475,000	1,763,000	1,311,000	1,219,000
Texas	502,000	459,000	453,000	378,000	769,000	639,000	558,000
Colo., Mont., Utah, Wyo., Ida.	40,000	97,000	118,000	85,000	335,000	485,000	474,000
California	817,000	555,000	728,000	527,000	1,100,000	1,114,000	1,086,000
Oregon and Washington	413,000	144,000	341,000	120,000	543,000	655,000	631,000
	11,098,000	8,161,000	8,784,000	7,156,000	23,056,000	22,223,000	21,218,000

PRODUCTION, SHIPMENTS AND STOCKS OF FINISHED PORTLAND CEMENT, BY MONTHS, IN 1930 AND 1931, IN BARRELS

Month	1930—Production—1931		1930—Shipments—1931		Stocks at end of month 1930	1931
January	8,498,000	6,595,000	4,955,000	4,692,000	27,081,000	27,759,000
February	8,162,000	5,920,000	7,012,000	5,074,000	28,249,000	28,612,000
March	11,225,000	8,245,000	8,826,000	7,192,000	30,648,000	29,676,000
April	13,521,000	11,245,000	13,340,000	11,184,000	30,867,000	29,715,000
May	17,249,000	14,010,000	17,224,000	14,200,000	30,891,000	29,554,000
June	17,239,000	14,118,000	18,781,000	16,077,000	29,364,000	27,602,000
July	17,078,000	13,899,000	20,153,000	15,545,000	26,289,000	25,934,000
August	17,821,000	13,549,000	20,299,000	15,172,000	23,824,000	24,313,000
September	16,124,000	12,092,000	18,083,000	13,671,000	21,889,000	22,736,000
October	14,410,000	10,762,000	15,599,000	12,360,000	20,697,000	*21,218,000
November	11,098,000	8,161,000	8,784,000	7,156,000	23,056,000	22,223,000
December	8,480,000	.....	5,688,000	.....	25,838,000	.....
	160,905,000	.....	158,744,000	.....	.....	.....

PRODUCTION AND STOCKS OF CLINKER (UNGROUND CEMENT) BY DISTRICTS, IN NOVEMBER, 1930 AND 1931 (IN BARRELS)

District	1930—Production—1931		Stocks at end of month 1930	1931
Eastern Pennsylvania, New Jersey and Maryland	2,235,000	1,922,000	917,000	601,000
New York and Maine	1,030,000	750,000	547,000	276,000
Ohio, Western Pennsylvania and West Virginia	1,263,000	747,000	834,000	705,000
Michigan	917,000	338,000	793,000	524,000
Wisconsin, Illinois, Indiana and Kentucky	1,337,000	1,047,000	755,000	464,000
Virginia, Tennessee, Alabama, Georgia, Florida, Louisiana	972,000	746,000	964,000	611,000
Eastern Missouri, Iowa, Minnesota and South Dakota	1,092,000	798,000	475,000	462,000
Western Missouri, Nebraska, Kansas, Oklahoma, Arkansas	885,000	578,000	447,000	495,000
Texas	498,000	479,000	331,000	289,000
Colorado, Montana, Utah, Wyoming and Idaho	29,000	58,000	305,000	88,000
California	1,002,000	609,000	1,081,000	1,292,000
Oregon and Washington	379,000	187,000	309,000	405,000
	11,639,000	8,259,000	7,758,000	6,212,000

EXPORTS AND IMPORTS OF HYDRAULIC CEMENT, BY MONTHS, IN 1930 AND 1931

Month	1930—Exports—1931 Barrels	Value	Barrels	Value	1930—Imports—1931‡ Barrels	Value	Barrels	Value
January	82,387	$293,135	41,199	$115,678	201,609	$207,461	97,057	$132,937
February	64,267	217,798	25,703	88,989	114,455	119,717	22,370	26,250
March	117,563	357,896	54,599	144,579	43,622	59,981	70,532	80,686
April	57,419	200,217	40,478	116,564	140,871	178,226	54,717	61,728
May	57,423	198,170	48,028	140,953	94,696	111,998	20,061	22,794
June	82,077	223,639	43,619	107,977	55,356	74,370	32,080	42,955
July	47,082	166,577	29,494	97,995	12,404	20,973	17,445	22,349
August	49,031	167,579	39,517	106,643	35,323	39,029	9,760	13,404
September	46,664	153,384	27,543	81,399	51,096	59,721	33,575	33,520
October	62,690	190,305	24,531	68,524	75,284	84,364	39,642	42,380
November	50,495	151,555	.....	.....	109,124	125,448	.....	.....
December	38,680	134,260	.....	.....	44,157	59,641	.....	.....
	755,778	$2,454,515	.....	.....	977,997	$1,140,929	.....	.....

Exports and Imports†*

Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

EXPORTS OF HYDRAULIC CEMENT BY COUNTRIES IN OCTOBER, 1931

Exported to—	Barrels	Value
Canada	1,102	$ 5,621
Central America	2,567	6,929
Cuba	2,259	5,658
Other West Indies and Bermuda	1,484	2,936
Mexico	2,570	8,619
South America	12,454	28,068
Other countries	2,095	10,693
	24,531	$68,524

IMPORTS OF HYDRAULIC CEMENT BY COUNTRIES AND BY DISTRICTS, IN OCTOBER, 1931

Imported from	District into which imported	Barrels	Value
Canada	Michigan	8	$24
Denmark	Porto Rico	14,633	12,438
France	New York	147	526
Japan	Hawaii	1,125	1,176
United K'g'd'm.	New York	23,729	28,216
Total		39,642	$42,380

DOMESTIC HYDRAULIC CEMENT SHIPPED TO ALASKA, HAWAII, AND PORTO RICO, IN OCTOBER, 1931

	Barrels	Value
Alaska	1,331	$ 3,270
Hawaii	20,499	49,004
Porto Rico	4,248	6,122
	26,078	$58,396

*The value of exports of domestic cement is the actual cost at the time of exportation in the ports of the United States whence they are exported, as declared by the shippers on the export declarations.

†The value of imported cement represents the foreign market value at the time of exportation to the United States.

‡Includes white nonstaining portland cement.

Reports on Progress of Investigation of Cement Industry

THE Federal Trade Commission announces that the first report of its general investigations on price bases is practically complete in draft form. It is said to be an economic analysis of price basing methods prevailing in the cement industry.

It also reports that, in its investigation of competitive conditions in the cement industry, questionnaire letters have been sent to manufacturers and state highway commissions outlining certain information desired.

RETAIL MATERIAL PRICES, DELIVERED, NOVEMBER 1, 1931 (COMPILED BY DEPARTMENT OF COMMERCE)

City	Portland cement, per bbl. exclu. of cont.	Gypsum wallboard, ⅜-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, ¾-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.40	.....	$15.00	$1.50	$2.00	.....
New London, Conn.	2.60	25.00	18.00	1.50	3.00	$18.00
Waterbury, Conn.	2.60	30.00	20.00	1.25	2.45	20.00
Haverhill, Mass.	2.32	25.00	18.00	.....	.....	18.50
New Bedford, Mass.	2.40	24.00	16.50	1.75	2.75	16.50
Albany, N. Y.	2.34	23.85	15.75	.....	.....	16.20
Buffalo, N. Y.	2.95	21.00	18.00	2.50	2.05	16.00
Poughkeepsie, N. Y.	1.95	.....	26.00	2.25	2.20	13.00
Rochester, N. Y.	2.28	22.00	20.00	2.25	2.40	16.00
Syracuse, N. Y.	2.16	25.00	13.00	1.80	1.70	15.00
Paterson, N. J.	2.00	24.00	18.00	1.50	2.10	17.50
Trenton, N. J.	2.20	20.00	18.00	1.50	2.15	18.00
Erie, Penn.	2.00	22.50	16.00	2.00	.....	16.00
Philadelphia, Penn.	2.10	.....	14.50	1.75	2.60	17.50
Scranton, Penn.	2.40	.....	20.00	3.25	.....	19.00
Baltimore, Md.	2.20	25.00	13.00	1.85	2.50	15.50
Washington, D. C.	1.65	25.00	12.00	.....	.....	16.00
Richmond, Va.	3.10	31.00	17.50	1.95	2.45	20.00
Fairmont, W. Va.	2.80	35.00	16.00	2.80	3.50	18.00
Columbia, S. C.	2.25	35.00	12.50	1.08	2.25	15.40
Atlanta, Ga.	2.50	.....	.....	2.81	2.50	19.75
Tampa, Fla.	2.60	.....	24.00	2.00	3.50	.....
Shreveport, La.	3.00	.....	.....	2.00	3.20	20.00
New Orleans, La.	2.35	.....	.....	1.85	.....	18.00
Akron, Ohio	1.74	.....	12.00	1.50	2.50	14.00
Canton, Ohio	.....	.....	$16.00	$2.50	.....	.....
Cincinnati, Ohio	$1.94	$22.75	14.40	2.63	$2.55	.....
Cleveland, Ohio	1.68	.....	10.00	1.69	2.15	$15.00
Columbus, Ohio	2.35	.....	12.00	1.50	2.75	14.40
Toledo, Ohio	1.40	21.00	14.00	1.60	1.75	14.00
Lansing, Mich.	2.25	.....	20.00	1.80	1.80	17.50
Saginaw, Mich.	1.80	25.00	16.50	2.25	2.20	18.00
Terre Haute, Ind.	2.25	28.00	18.00	1.25	3.00	18.00
Chicago, Ill.	1.25	25.00	12.50	1.75	1.25	13.00
Louisville, Ky.	1.86	.....	15.00	2.00	2.15	17.00
Milwaukee, Wis.	1.25	22.00	.....	1.25	1.25	15.20
Des Moines, Iowa	1.42	23.50	19.00	1.40	4.15	14.00
Kansas City, Mo.	1.68	25.00	.....	1.60	1.88	15.00
St. Louis, Mo.	.....	.....	18.00	1.35	1.30	18.00
St. Paul, Minn.	2.15	21.00	19.00	1.25	1.75	17.00
Grand Forks, N. D.	2.60	.....	.....	2.60	.....	19.00
Sioux Falls, S. D.	2.00	40.00	22.00	1.25	2.25	15.00
Tulsa, Okla.	1.90	22.50	22.00	.85	2.36	16.00
Wichita, Kan.	1.60	23.00	22.50	1.00	.....	15.00
San Antonio, Tex.	2.43	42.00	20.00	2.25	2.35	17.00
Tucson, Ariz.	3.25	45.00	30.00	1.25	2.25	17.10
San Francisco, Calif.	.....	45.00	22.50	1.40	1.60	16.90
Seattle, Wash.	2.40	35.00	22.00	1.40	1.50	18.00

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Ready-Mixed Concrete Producer Uses Gravel in One Plant, Crushed Stone in Another

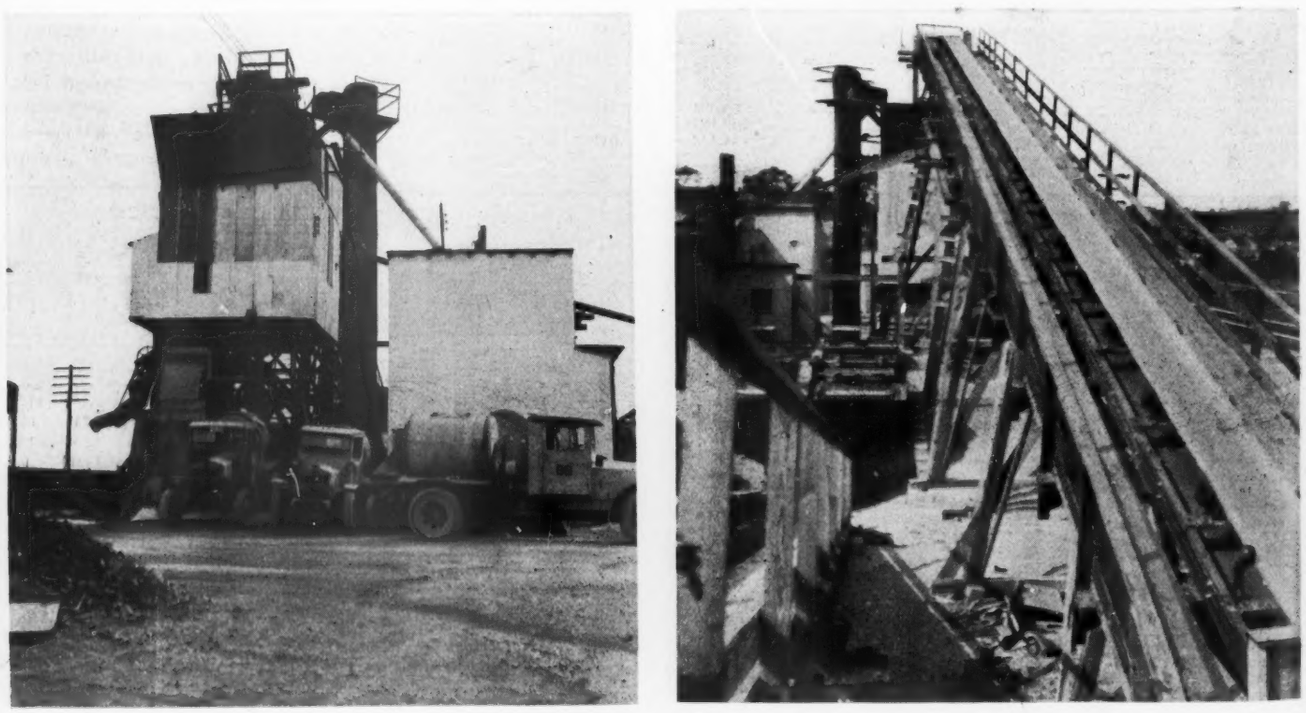
Metropolitan Concrete Co., Cleveland, Ohio, Adds Seventh Plant and Can Now Furnish Customers with Either Gravel or Stone Concrete

By George M. Earnshaw

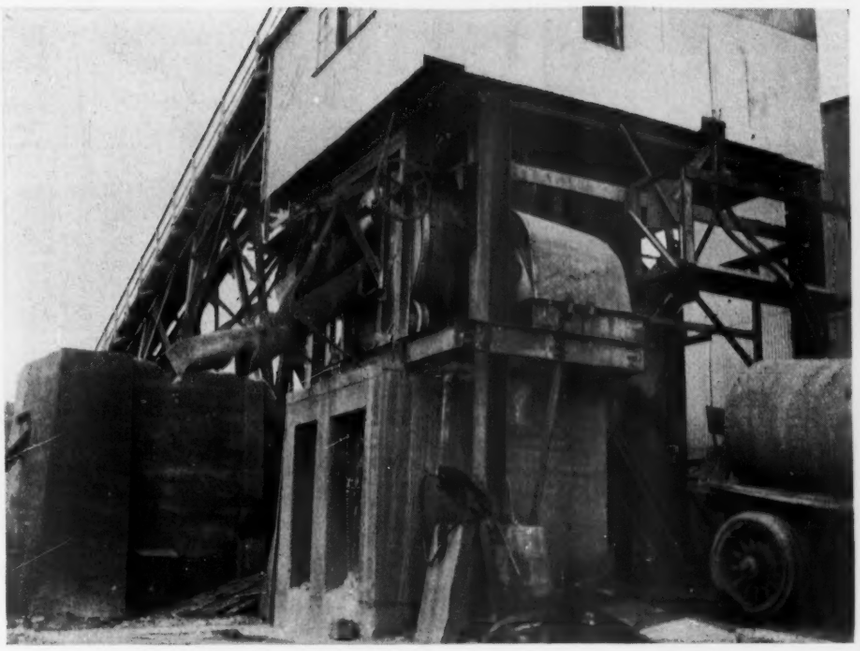
THE Cleveland Trinidad Paving Co., Cleveland, Ohio, was one of the first companies to recognize the merits of ready-mixed concrete, and about seven years ago put its first plant into operation. These early plants were intended, however, to take care of the company's own requirements for paving work. When there developed a commercial demand for the product the company decided to get out of the business. And thus three years ago was born the Metropolitan Concrete Co., now operating seven ready-mixed plants in and around Cleveland.

At various times the company relocated the plants according to requirements of the various sections of the city, for it is well known among operators in this industry that strategic locations are all-important to the success of the business. At present the Metropolitan company is operating only three of its plants; this article deals with the largest and best located plant, which uses crushed stone as an aggregate, and with the newest one, which uses gravel. The new operation, incidentally, is the only one of the seven using gravel.

The reason for the popularity of crushed stone as an aggregate at these plants is that it can be laid in at the plants at a lower cost than gravel, and also stone concrete is more generally acceptable to Cleveland architects and contractors. The crushed stone comes in by boat from nearby lake ports at com-



Two views of the new plant from which either central-mixed or transit-mixed concrete can be furnished



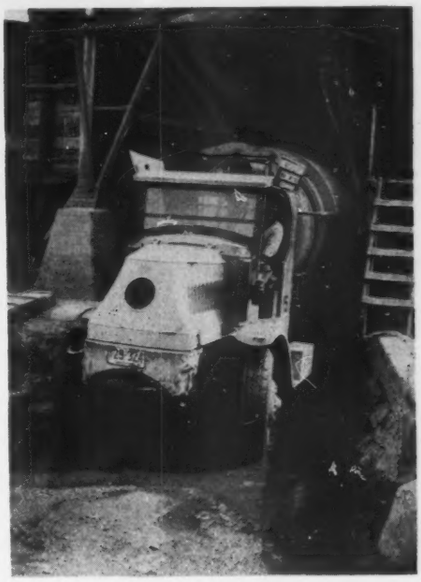
Mixer discharge chute at left and dry-batch chute at right

paratively low rates, whereas gravel comes in by rail at higher rates. This is only true, though, in the case of plants located in the northern and main part of the city. In the outlying sections, south, southeast and southwest, there are gravel deposits, making it possible for gravel to come into the picture. It was because of this that Metropolitan looked for and found a spot in this part of the city for a plant, about seven miles south from the downtown section of the city, at Broadway and East 131st street.

Cooperation with Builders' Supply Company

This new plant is located near the gravel pits and in the storage yards of the Cleveland Builders' Supply Co., and the price paid this company per ton by Metropolitan includes delivery to the bins. The sand and gravel is carried to the storage bins above the mixing plant on a 24-in. belt conveyor, having been loaded into a field hopper by a locomotive crane. This equipment is owned by the builders' supply company. The plant itself is made up of equipment taken from dismantled plants and was assembled by the Metropolitan company's own men. It is designed to batch for either wet or for dry mix. This is effected by merely throwing a lever controlling a chute gate. For wet mix there is a 2-yd. capacity Lakewood mixer from which the concrete is chuted into Clinton trucks for delivery. Transit-mix trucks deliver the dry-mix batches. The company owns seven 3-yd. and four 2-yd. Clintons and 15 Transit-mix trucks. Six of the latter are mounted on Mack chassis, five on Seldon's, three on White's, and one on an International. In addition to these, the company also owns a fleet of 20 Hug 2½-yd. dump trucks for delivering to paving jobs.

Bulk cement is used exclusively at this plant and is hauled in a covered 5-ton White dump truck direct from a cement company's storage silos near the lake front. The cement is dumped direct into a steel hopper, from which a screw conveyor takes it to an enclosed chain-bucket elevator. The elevator can discharge either into a small 10-bbl. capacity steel bin located over the mixer or into a large steel storage bin. (Removal from this storage bin is done by the same screw conveyor which originally delivered the cement to the elevator, there being a gravity flow connection between the bin and the conveyor.) In all, this plant is not a big nor elaborate one; it is a home-made one, made over from this and that part of other plants. But it is an efficient one, being operated by but one man; it is flexible and fast



Dry batch transit mixing trucks leaving East 40th St. plant

and excellently located, and, above all, doesn't have to turn out very many batches per day to return the interest on the investment.

Company's Largest Plant

The company's largest and most strategically located plant is in the yards of the Cleveland Builders' Supply Co. on the lake front at East 40th street, and it is from this

Two views of the East 40th St. plant; the trucks dump into the bins

The fleet of agitator body trucks for central mixed concrete

one that the heart of the city is served. Although stated above that this plant uses crushed stone as the coarse aggregate, there are exceptions in the case of slag. In laying out this operation advantage was taken of the contour of the ground and the plant was set into the side of a cliff, perhaps 30 ft. high. This made it possible to dump the aggregates direct from trucks into the storage bins serving the plant. Here, as at the Broadway plant, the Cleveland Builders' Supply Co. delivers the materials into the bins, except of course the cement.

This plant is a standard Blaw-Knox unit,

Part of the fleet of transit mixing trucks

designed and erected by that company. It is a straight dry-mix plant, however, delivering into Transit-mix trucks. Batches up to 4 yd. each can be made, and the rated capacity per hour is 50 yd. There are three aggregate bins of 50 tons each, from which the feed is by gravity. The only piece of powered equipment in the plant is the screw conveyor for delivering the cement from its bin to the batcher. This operation is called on for a considerable amount of concrete using special cements of high early strength, all of which is shipped to the plant in sacks. With the exception of the specials, however, the plant uses bulk cement.

It is not the intention to make a comparison of a ready-mixed concrete plant using crushed stone with one using gravel. Such would be quite impossible with these particular two plants anyway, since their design and equipment are so radically different. The purpose is to show how an enterprising and wide-awake concern can take advantage of natural conditions and profitably expand its business regardless of the kind of aggregate used. The president of the Metropolitan Concrete Co. is W. H. Crangle; the secretary and treasurer, S. J. Kling.

Testing Concrete and Concrete Materials

TESTS for concrete and concrete materials are discussed by J. Singleton-Green in the July issue of the British publication, *Cement, Lime and Gravel.* He gives as the conditions necessary for any tests: 1. A property that is measurable. 2. A standard of comparison. 3. A representative sample in a form which can be tested. 4. A method and the necessary equipment for conducting the test. 5. A result that can be interpreted. All tests, the paper says may be grouped under the headings: (1) Materials; (2) Design; (3) Acceptance; (4) Service.

All materials of concrete require testing, except perhaps, the water. If there is any doubt about the water this should be analyzed by a competent laboratory. Cement should be tested to see that it is up to specification requirements, but this too is a job for a well equipped laboratory.

A full investigation of aggregates includes testing for the following: (1) Sieve analysis; (2) Organic impurities; (3) Silt, etc.; (4) Mortar strength; (5) Wear; (6) Mineralogical composition; (7) Voids; (8) Toughness; (9) Durability; (10) Free and absorbed moisture; (11) Fire resistance; (12) Weight.

Of these the tests that should always be made are (1), (2), (3) and (10). If the sieve analysis is to be used to find the fineness modulus, the necessary sieves should be included. Organic impurities may be tested for by the colormetric method, and silt is found by the decantation method. Moisture may be found either by drying to constant weight, using denatured alcohol, or by the displacement method with a cylindrical container.

A knowledge of the contained and surface moisture of a sand is essential for the correct application of the water-ratio theory. For instance, in a 1 : 4 mix, a change of 1% in the moisture content of an aggregate would make a difference of about half a gallon of water per cwt. (112 lb.) of cement. Absorption is of extreme importance when impermeable concrete is desired.

For admixtures, the author of the article recommends the use of A. R. Lord's questionnaire in lieu of actual tests.

Under the heading, design, the author recommends the use of trial methods and the use of the fineness modulus as a "yard stick" by which the concrete making properties of the aggregate may be measured. Test for slump, flowability and workability will also come under this heading.

Until recently, the article says, it has been almost universal to accept or reject concrete on a test for compressive strength. But recently tests for flexure and tension have been investigated and it seems that these may be used more often as the technique of making them is developed. Since durability is of prime importance, tests for permeability will have in the future a greater value than they now have. For wear a test for abrasion is indicated and possibly one for impact. Samples to test the proportions of the concrete may be taken before the concrete has set or after it has hardened, but if accurate results are required an analysis will have to be made in a laboratory.

Service tests may be made at any time, their main value being to give information on which decisions can be made for future work.

The Rock Products Market

Wholesale Prices of Aggregates

(F.O.B. Plant or City Designated)

Prices given are for crushed limestone per ton, unless otherwise stated

	Crushed stone			Gravel	Slag	
	Screenings, ¼ in. down	½ in. and less to 2½ in.	Sand ¼ in. and less	½ in. and less to 2 in.	Screenings, ¼ in. down	Crushed, ½ in. and less to 3 in. and larger
EASTERN:						
Alexander, N. Y.			.65d	.65d		
Bethlehem, Penn.					.50– .60	.50–1.00r
Boston, Mass. (g)			1.15	1.75		
Buffalo, N. Y.	1.25¶	1.25¶	1.00–1.10d	1.00–1.10d	1.50d	1.50–1.60d
Clarence, N. Y.			.60v	.60v		
Durham, Penn.			.70– .80	.80– .90		
Hillsville, Penn.	.85	1.35				
Montoursville, Penn.			.60– .75	.40– .50		
New York City			1.00	1.50		
Oriskany Falls, N. Y.	50–1.00	.80–1.35	.50– .80	.50–1.00		
Philadelphia, Penn. (trap rock)	2.10–3.45	2.30	1.40	1.95		
Rochester, N. Y.			.40	.40		
Washington, D. C.			.85	1.30		
CENTRAL:						
Alton, Ill.	1.75					
Cape Girardeau, Mo.	.90	1.00				
Chicago, Ill.			.90	1.00		
Davenport, Iowa	1.00	1.25				
Eau Claire, Wis.			.30– .40	.65– .85		
Grand Rapids, Mich.			.40– .50	.60– .70		
Greenbush, Mich.			.35	.65		
Hannibal, Mo.	1.00	1.25				
Indianapolis, Ind.			.40– .81*	.54–.94½*		
McCook, Ill.	.60	.60				
Milwaukee, Wis.	1.14	1.24	.75y	.90y		
Munger, Ill.			.25	.40		
Pacific, Mo.			.70	1.00		
Riverton, Ind.			.40– .60	.60– .75		
Sheboygan, Wis.	1.00	1.00				
Stone City, Iowa	.75	1.00				
St. Louis and Maplewood, Mo.	1.25	1.25				
St. Paul, Minn.	.50	1.25	.35	1.25		
Toledo, Ohio	1.10	1.60			1.00	1.10
Waukesha, Wis.		.90	.30	.45		
SOUTHERN:						
Atlanta, Ga. (granite)	1.10	1.50				
Cartersville, Ga.	.75	.75	1.00	.90		.80
Ensley and Alabama City, Ala.					.80	.80–1.25j
Chico, Tex.	.50	1.10–1.30				
(Trap rock)	2.25	1.10				
Columbia, S. C. (granite)	.40	1.40				
Fort Worth, Tex.			.50	.50½–.75		
Houston, Tex.			1.25*	1.95k		
Knoxville, Tenn.	.50	1.00	.75–1.00z	1.00–1.20z		
Longdale, Va.					.75	1.05–1.25
Montgomery, Ala.			.25– .35	.50– .60		
Paducah, Ky.			.45	.60– .90		
Richmond, Va.			1.15	1.75		
Roseland, La.			.40	.75		
San Antonio, Tex.	1.25¶	1.25¶		1.25		
Tyrone, Ky.	.50– .90	.50–1.25				
WESTERN:						
Crushton, Calif. (San Gabriel Valley) (granite)	1.40	1.40	.80	1.40		
Denver, Colo. (h)			1.25*	2.10*		
Long Beach, Calif. (Granite and trap rock)	2.40	2.40	1.50	2.40		
Phoenix, Ariz. (n)			1.15	1.00		
Roscoe, Calif. (San Fernando Valley) (granite)	1.40	1.40	.80	1.40		
Salt Lake City, Utah			.60	.60– .80		
San Francisco, Calif. (Bay points)			1.45	1.45		
Seattle, Wash.			1.25*	1.25*	1.25	1.25
Spokane and Irvin, Wash.			*1.00¶–1.50x			
Tulsa, Okla.	.70s	1.35s				

*Prices per cu. yd. ¶F.o.b. cars. †Less 10c per ton monthly settlements disc. ‡Prices less 5c disc. per ton for payment 15th following month. (a) Consumer prices subject to cash disc. of 10c per ton. (b) ½ in. to 1½ in. (c) 1½ in. and less. (d) F.o.b. trucks at plant. (e) Delivered in truck loads. (f) ¾ in. to 2½ in. (g) Delivered to job by truck, Boston. (h) F.o.b. job site via motor truck. (j) 3 in. and larger, 80c; ½ in. and less, 1.25. (k) Less 10c cash disc. (m) 2 in. and less. (n) Per cu. yd. f.o.b. bunkers. (p) Hard-head stone. (q) ¼ in. to 2½ in. (r) Crushed slag, ½ in., 90c–1.00; ¾ in., 50c–60c; 1½ in., 60c–70c; 2½ in., 60c–80c. (s) Less 15c per ton for cash 10 days. (t) Delivered on job. (u) F.o.b. plant. (v) F.o.b. cars or trucks. (x) Per cu. yd. delivered by truck in city of Spokane. (y) Also 1.00–1.50 per cu. yd (z) Also 60c per ton.

Fullers Earth

Prices per ton in carloads, f.o.b. Florida shipping points. Bags extra and returnable for full credit.

16– 30 mesh	20.00
30– 60 mesh	22.00
60–100 mesh	18.00
100 mesh and finer	9.00
Joliet, Ill.—All passing 100 mesh, f.o.b. Joliet, incl. cost of bags	24.00

Roofing Slag

Prices given are per ton f.o.b. city named.

Bethlehem, Penn.	1.00–1.50‡
Buffalo, N. Y.	2.50†
Ensley and Alabama City, Ala.	2.05
Longdale, Va.	2.50
Toledo, Ohio	1.10
Woodward, Ala.	2.05*

*Less 5c ton disc. for pay. 15th following month. †Price f.o.b. trucks at plant, subject to discount of 10c per ton for payment on or before the 15th of following month. ‡F.o.b. plant.

Agricultural Limestone

(Crushed)

Alton, Ill.—90% thru 100 mesh	4.50
Cartersville, Ga.—Pulverized limestone, per ton, 2.00; 90% thru 50 mesh, per ton	1.25
Chico, Tex.—Pulverized limestone, in 100-lb. bags, per cwt.	1.00
Colton, Calif.—Analysis, 95.97% $CaCO_3$; 1.31% $MgCO_3$ all thru 14 mesh down to powder	3.50
Davenport, Iowa — Analysis, 90-98% $CaCO_3$; 2% and less $MgCO_3$; 90% thru 4 mesh; bulk	1.00
Dolomite, Calif.—Analysis, 54% $CaCO_3$; 45% $MgCO_3$; 99% thru 10 mesh, per ton, 2.10; 49% thru 60 mesh, ¼-in. to dust, per ton	1.70
Gibsonburg, Ohio—Analysis, 55% $CaCO_3$; 43.40% $MgCO_3$; 50% thru 50 mesh, 1.25; pulverized, bulk, 3.00; in bags	4.50
Hillsville, Penn.—Analysis, 91.53% $CaCO_3$; 0.98% $MgCO_3$, f.o.b. destinations, per ton	5.00–5.65
Knoxville, Tenn.—80% thru 100 mesh, per ton, 2.00; in bags, per ton	3.25
Lannon, Wis.—50% thru 100 mesh	1.50
Marlbrook, Va.—Precipitated lime; analysis, 97% $CaCO_3$, 50% thru 50 mesh, per ton	2.00
McCook, Ill.—Analysis, 55% $CaCO_3$; 45% $MgCO_3$ 90% thru 50 mesh, 50% thru 50 mesh 90% thru 4 mesh, 50% thru 4 mesh, all per ton	.60
Middlebury, Vt.—Analysis, 99.05% $CaCO_3$; 90% thru 50 mesh	4.25
Osborne, Penn.—50% thru 100 mesh, per ton	2.50–4.00
Stone City, Ia.—Analysis, 98% $CaCO_3$; 50% thru 50 mesh	.75
Waukesha, Wis.—90% thru 100 mesh, 4.10; 50% thru 100 mesh, per ton	2.10
West Rutland, Vt.—Analysis, 96.5% $CaCO_3$; 1% $MgCO_3$; 50% thru 100 mesh, in 80-lb. bags, per ton	3.75

Pulverized Limestone for Coal Operators

Davenport, Ia.—Analysis, 90-98% $CaCO_3$; 2% and less $MgCO_3$; 100% thru 20 mesh, 50% thru 200 mesh; sacks, ton	6.00
Joliet, Ill.—Analysis, 48% $CaCO_3$; 42% $MgCO_3$; 90% thru 200 mesh (bags extra)	3.50
Waukesha, Wis.—90% thru 100 mesh	4.10

Rock Phosphate

Prices given are per ton (2240 lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

Fernandina, Fla., B.P.L. 77/76%, per ton	6.50
Mt. Pleasant, Tenn.—B.P.L., 72%, per ton, 5.00–5.50; furnace lump, B.P.L., 75%, per ton	6.25

Ground Rock

(2000 lb.)

Mt. Pleasant, Tenn.—(Lime phosphate) —B.P.L. 75%; per ton, bags extra	12.80
Ground rock, B.P.L. 72%, per ton	5.00– 5.50

Florida Phosphate

(Raw Land Pebble)

Mulberry, Fla.—Gross ton, f.o.b. mines 68/66% B.P.L.	3.15
70% minimum B.P.L.	3.75
72% minimum B.P.L.	4.25
75/74% B.P.L.	5.25
77/76% B.P.L.	6.25

Chicken Grits

Chico, Tex.—(Limestone) packed in 100-lb. sacks, per cwt., f.o.b. cars at plant	1.00
Cranberry Creek, N. Y.—Per ton	12.00
Davenport, Iowa—High calcium carbonate limestone, in bags, L.C.L., per ton	6.00
Gibsonburg, Ohio—(Agstone)	10.00
Hannibal, Mo.—(Limestone), sacked, f.o.b. plant, per ton	8.00
Indianapolis, Ind.—Per cu. yd.	.54
Los Angeles, Calif.—Marble grits, per ton, incl. sacks	10.00–12.50
Middlebury, Vt.—Per ton (a)	10.00
New York City—Per cu. yd.	1.00
Oriskany Falls, N. Y.—(Limestone) per ton	2.50– 3.75
Port Clinton, Ohio—(Gypsum), per ton	6.00
Salt Lake City, Utah—Per ton	.60
Warren, N. H.—(Aggregate)	7.80–11.00
Waukesha, Wis.—(Limestone), per ton	7.00

(a) F.o.b. Middlebury, Vt.

Mica

Prices given net, f.o.b. plant or shipping point.

Martinsville, Va.—Mica schist, per ton	10.00
Penland, N. C.—Mine scrap, per ton, 18.00; roofing mica, per ton	20.00
Franklin, N. C.	
Mine scrap, per ton	18.00
Ground mica, per ton at mill, 20 mesh, 27.50; 40 mesh, 30.00; 100 mesh	50.00
Wet ground mica, per lb., delivered	.05
Punch, per lb.	.06

Glass Sand

(Silica sand is quoted washed, dried and screened)

Klondike, Mo.	2.00
Ohlton, Ohio	2.40
Ottawa, Ill. (Per ton, f.o.b. Ottawa)	1.25
South Vineland, N. J.	1.50

Miscellaneous Sands

City or shipping point	Roofing sand	Traction
Eau Claire, Wis.	.....	.50–1.00
Ohlton, Ohio	1.50	1.50

Core and Foundry Sands

Silica sand quoted washed, dried, screened unless otherwise stated; lowest net prices per ton f.o.b. plant

City or shipping point	Molding: Fine	Molding: Coarse	Molding: Brass	Core	Furnace lining	Sand blast	Stone sawing
Albany, N. Y.	1.80	1.80	1.80	1.50	.....	3.00	.....
Columbus, Ohio	1.50	1.50	.....	.....	.....	3.50	.....
Eau Claire, Wis.	.....	.....	.....	.....	.....	2.00b	.....
Elco, Ill.	Amor. silica, 90-99½% thru 325 mesh, $10.00						
Montoursville, Penn.	.....	.....	.....	1.35a	.....	.....	.....
New Lexington, Ohio	2.25	1.75	.....	.....	.....	.....	.....
Ohlton, Ohio	1.50	1.50	.....	1.50	1.50	1.50	.....
Ottawa, Ill.	.....	.....	.....	.....	.....	3.50	.....

South Vineland, N. J.—Dry washed silica, 2.00 per ton.
(a) To 1.60. (b) To 3.00.

Wholesale Prices of Slate

Lowest prices f.o.b. at producing point or nearest shipping point

Slate Flour

Pen Argyl, Penn.—Screened, 200 mesh, 6.00 per ton in paper bags

Slate Granules

Pen Argyl, Penn.—Color, blue-grey, per ton 6.00*
*Bags, 10c each, returnable for credit.

Roofing Slate

Prices per square—Standard thickness

City or shipping point	3/16-in.	¼-in.	3/8-in.	½-in.	¾-in.	1-in.
Bangor, Penn.—						
Gen. Bangor No. 1 clear	10.00	20.00	25.00	29.00	40.00	50.00
Gen. Bangor No. 1 ribbon	9.00	16.00	20.00	25.00	35.00	46.00
No. 1 Albion	7.25	16.00	23.00	27.00	37.00	46.00
Gen. Bangor No. 2 ribbon	6.75	.....	.....	.....	.....	.....
Chapman Quarries, Penn.—						
Smooth texture	9.00–11.00	.....	.....	.....	.....	.....
Rugged	8.25– 9.00	a12.50	b18.00	b21.50	d25.00	e30.00

Pen Argyl, Penn.—Albion blue-grey roofing slate, No. 1 clear, 7.25–10.50; mediums, 8.00–9.00; No. 1 ribbon, 8.00–8.50; subject to 30% discount; punching, all sizes, 50c per square.
(a) To 15.00. (b) To 26.50. (d) To 32.00. (e) To 37.00.

Prices are for standard preferred sizes (standard 3/16-in slates), smaller sizes sell for lower prices. Prices other than 3/16-in. thickness include nail holes. Prices for punching nail holes, in standard thickness slates, vary from 50c to $1.25 per square.

Portland Cement

	F.o.b. city named Per Bag	Per Bbl.	High Early Strength
Atlanta, Ga.	.....	†1.87	2.92¶
Birmingham, Ala.	.....	†1.56	2.61¶
Boston, Mass.	.43½	1.74†	2.48¶
Charleston, S. C.	.....	1.89†	2.94¶
Chicago, Ill.	.....	1.05†	2.11¶
Cincinnati, Ohio	.....	1.23†	2.09¶
Cleveland, Ohio	.....	.....	2.34¶
Columbus, Ohio	.....	.....	2.26¶
Dayton, Ohio	.....	.....	2.19¶
Detroit, Mich.	.....	.....	2.30¶
Indianapolis, Ind.	.....	1.39†	2.04¶
Jackson, Miss.	.....	†1.94	2.99¶
Jacksonville, Fla.	.....	†1.96	3.01¶
Kansas City, Mo.	.25½	1.02†	.....
Los Angeles, Calif.	.57½	2.30	.....
Louisville, Ky.	.....	1.41†	2.09¶
Memphis, Tenn.	.....	†1.73	2.73¶
Milwaukee, Wis.	.....	1.45†	2.20¶
Montreal, Que.	.....	1.66§	.....
New Orleans, La.	.....	1.86†	2.96¶
New York, N. Y.	.37½	1.49†	2.24¶
Oklahoma City, Okla.	.38½	1.54†	.....
Omaha, Neb.	.34	1.36†	.....
Portland, Ore.	.....	2.40‡	.....
Reno, Nev.	.....	2.76‡	.....
St. Louis, Mo.	.....	1.20†	2.09¶
San Francisco, Calif.	.....	2.04‡	.....
Savannah, Ga.	.....	1.89†	2.94¶
Seattle, Wash.	.....	2.20–2.45	2.80c
Tampa, Fla.	.....	2.00†	3.16¶
Toledo, Ohio	.....	.....	2.28¶
Topeka, Kan.	.30¼	1.21†	.....
Tulsa, Okla.	.36½	1.46†	.....
Mill prices f.o.b. in carload lots, without bags, to contractors.			
Hudson, N. Y.	.....	*1.21–‖1.36†	‖2.29¶
Lime & Oswego, Ore.	.....	2.40	.....
Limedale, Ind.	.....	1.50†	.....

NOTE: Unless otherwise noted, prices quoted are net prices, without charge for bags. Add 40c per bbl. for bags. †Includes 10c cash disc. ‡Subject to 2% discount payment 10th of month following invoice date. ¶"Incor" Perfected, prices per bbl. packed in paper sacks, subject to 10c discount 15 days. (c) Quick-hardening "Velo," packed in paper bags, 10c discount 10 days. §Sales tax included at 4%. *Cars mill. ‖Trucks mill.

ROCK PRODUCTS solicits volunteers to furnish accurate price quotations.

Special Aggregates

Prices are per ton f.o.b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco-chips
Brandon, Vt.—English pink, cream and coral pink	¶12.50–‖14.50	¶12.50–‖14.50
Cardiff, Md. — Crushed green marble (a)	¶12.50–‖14.50	¶12.50–‖14.50
Cranberry Creek, N. Y.	.....	‖12.00
Los Angeles, Calif.—(a)		
White	¶11.00–‖13.50	¶11.00–‖13.50
Snowflake	.....	¶11.00–‖13.50
Golden, browns, grey, blues, blacks	¶16.00–‖18.50	¶16.00 ‖18.50
Dolomite, Calif. (Lone Pine)—(a)		
White	¶8.80– ‖8.80	¶8.80– ‖8.80
Snowflake	.....	¶8.80– ‖8.80
Golden, browns, grey, blues, blacks	¶13.80–‖13.80	¶13.80–‖13.80
Middlebrook, Mo.—Red	.....	20.00– 25.00
Middlebury, Vt.—White	.....	¶9.00–‖10.00
Randville, Mich.—Crystalite, crushed white marble, bulk	4.50	4.50– 5.00
Tuckahoe, N. Y. (b)	5.00– 6.00	.....
Warren, N. H.	.....	¶5.80–11.00

¶C.L. ‖L.C.L. *Per 100-lb. (a) Including bags. (b) 5.00 per ton on 5-ton orders; less than 5 tons, 6.00 per ton.

Art and Cast Stone Aggregates

Cardiff, Md.—Green marble fines in carloads; bulk, 7.50; in bags	10.00
Los Angeles, Calif.—Dolomite aggregates, all sizes and colors†	¶10.00 ‖12.50
Dolomite special cast stone, wet-cast aggregate, white, ¼-in. to dust a5.30	

† 100-lb. sacks. ¶C.L. ‖L.C.L. (a) In open cars.

Masonry Cement

The prices shown here are for various brands of masonry and mortar cement, including cost of bags.

	Per bag	Per bbl.
Cincinnati, Ohio	.....	†1.64
Columbus, Ohio	.....	†1.71
Dayton, Ohio	†.39	†1.56
Detroit, Mich.	†.41¾	†1.67
Indianapolis, Ind.	.....	†1.60
Louisville, Ky.	.....	†1.52
Memphis, Tenn.	.....	†1.84
Norfolk, Va.	†.49½	†1.98
St. Louis, Mo.	†.40¾	†1.63
Toledo, Ohio	†.41	†1.64
Winston-Salem, N. C.	†.46½	†1.86

†Packed in paper sacks; price includes cost of sacks, and is subject to 10c bbl. discount for payment in 15 days.

Lime Products

(Lowest carload prices per ton f.o.b. shipping point unless otherwise noted)

	Finishing hydrate	Masons' hydrate	Agricultural hydrate	Chemical hydrate	Ground burnt lime, Bulk	Ground burnt lime, Bags	Lump lime In bulk	Lump lime In bbl.
EASTERN:								
Buffalo, N. Y.	6.50	5.50	5.50	11.00	6.00	8.00	6.00	.....
Cedar Hollow, Devault, Rambo and Swedeland, Penn.	.....	8.00c	8.00c	8.00c	7.00	8.00	8.00	.....
Lime Ridge, Penn.	.....	.....	8.00	.....	6.00	7.00	4.50	.....
CENTRAL:								
Cold Springs, Ohio	.....	5.50	5.50	.....	.....	.....	6.00	.....
White Rock, Gibsonburg, Marblehead, Tiffin, Ohio, and Huntington, Ind.	6.50*	5.50	5.50	11.00	6.00	8.00	6.00	.....
Delaware, Ohio	6.50	5.50	5.50	6.50	.....	.....	5.50	.....
Sheboygan, Wis.	.....	10.50	.....	.....	.....	.....	8.50	19.00
Woodville, Ohio (x)	6.50	5.50c	5.50c	13.50	6.00	8.00	6.00	14.00
SOUTHERN:								
Eagle Mountain, Va.	11.00	8.00	8.00	8.00	6.50	8.00	6.50	.....
Keystone, Ala.	.....	8.00	8.00	7.50	.....	.....	5.00	.....
Knoxville, Tenn.	.....	8.00	8.00	7.50	5.00	12.77	5.00	13.88
Cartersville, Ga.	.....	8.00	8.00	7.00	.....	.....	.....	.....
WESTERN:								
Kirtland, N. Mex.	.....	.....	.....	.....	.....	.....	.....	12.00d
Little Rock, Ark.	.....	11.90	.....	11.90	.....	.....	9.90	16.90
San Francisco, Cal. (b)	20.00	20.00	12.00	20.00	.....	.....	.....	.....
San Francisco, Calif.	§19.00	15.00	12.50	14.00	11.00	13.50†	11.00	19.80‖

(a) In 100-lb. bags. (b) Woodburnt lime: finishing hydrate, 20.00 per ton; pulv. lime, 2.00 per iron drum. Oil-burnt pulv. lime, 13.00–14.50 per ton. (c) In 50-lb. paper. (d) To 15.00. *At White Rock and Gibsonburg, Ohio. ¶In 200-lb. steel barrels. ‖Refund for return of barrels. §To dealers and industrial concerns in carload lots. †To 17.50, plus bags as supplied. (x) Ohio Ritewall hair-fibered finishing lime, per ton, in 50-lb. paper bags, 9.00.

Potash Feldspar

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.30%; Na_2O, 2%; SiO_2, 67%; Fe_2O_3, 0.10%; Al_2O_3, 18%; per ton, in bulk 15.00

Topsham, Me.—White; analysis, K_2O, 9.25%; Na_2O, 3%; SiO_2, 71%; Fe_2O_3, 0.09%; Al_2O_3, 16.75%; pulverized, 99% thru 200 mesh; per ton in bulk, 17.25; in bags 17.45

Trenton, N. J.—White; analysis, SiO_2, 69%; Na_2O, 3%; K_2O, 9%; Fe_2O_3, 0.08%; Al_2O_3, 18%, pulverized, 99% thru 200 mesh; per ton, in bulk, 19.00; in bags, per ton 20.20

West Paris, Me.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 11.20%; Na_2O, 3.20%; SiO_2, 65.70%; Fe_2O_3, 0.09%; Al_2O_3, 19.20%; per ton, in bulk 19.00

Soda Feldspar

Spruce Pine, N. C.—(Chemically controlled.) Color, white; 200 mesh; analysis, K_2O, 5.50%; Na_2O, 5.50%; SiO_2, 68.80%; Fe_2O_3, 0.10%; Al_2O_3, 18.60%; per ton, in bulk 18.00

Concrete Block

Prices given are net per unit, f.o.b. plant or nearest shipping point.

Camden, N. J.: 8x8x16, each .17a

Lexington, Ky.:
8x8x16 ‡18.00*
8x8x16 †16.00*

Omaha, Neb. (Prices f.o.b. plant)
8x8x16, each .10

Wichita, Kan.:
4x8x16, each .07

*Price per 100 at plant. †Rock or panel face. ‡Face. (a) Less 10%.

Cement Drain Tile

Longview, Wash.—Price per foot.

3-in.	.05	6-in.	.10
4-in.	.06	8-in.	.15

Cement Roofing Tile

Prices are net per square, carload lots, f.o.b. nearest shipping point, unless otherwise stated.

Cicero, Ill.—French and Spanish tile, 9x15-in., per sq. 9.50–12.00
Closed end shingle, 8½x12½ in., per sq. 11.00–13.00

New York City, N. Y.—Red, per sq., 10.00; green, per sq. 12.00

Cement Building Tile

	Plain	Glazed
Lexington, Ky.:		
5x8x12, per 1000	55.00	
4x5x12, per 1000	35.00	
Wichita, Kan. (Duntile)		
8x8x12-in., each	.08	....
6x8x12-in., each	.07	....
6x6x12-in., each	.06	....
4x5x12-in., each	.05	.08
4x4x12-in., each	.04	.07½

Concrete Brick

Prices given per 1000 brick, f.o.b. plant.

	Common	Face
Longview, Wash.	15.00	25.00– 60.00
Milwaukee, Wis.	13.00	35.00
Omaha, Neb.	15.00	
Prairie du Chien, Wis.	12.00	20.00– 22.50
Wichita, Kan., per 100	*8.00	*8.50

*8x8x16 size.

Stone-Tile Hollow Brick

Prices are net per thousand, f.o.b. plant.

	No. 4	No. 6	No. 8
Albany, N. Y.*†	40.00	60.00	70.00
Altadena, Calif.	45.00	55.00	65.00
Asheville, N. C.	30.00	40.00	50.00
Atlanta, Ga.	29.00	42.50	53.00
Auburn, Wash.	.....	50.00	65.00
Brownsville, Tex.	.....	53.00	62.50
Brunswick, Me.	29.50	42.25	55.00
Chula Vista, Calif.	32.50	42.50	50.00
Daytona Beach, Fla.	45.00	55.00	65.00
Frostproof, Fla.	45.00	65.00	75.00
Houston, Tex.	36.00	53.00	66.00
Klamath Falls, Ore.	50.00	60.00	70.00
Longview, Wash.‡	.....	50.00	60.00
Los Angeles, Calif.	29.00	39.00	45.00
Macon, Ga.	25.00	35.00	45.00
Mattituck, N. Y.	45.00	55.00	65.00
Medford, Ore.	50.00	55.00	70.00
Memphis, Tenn.	45.00	50.00	60.00
Mineola, N. Y.	40.00	50.00	60.00
Nashville, Tenn.*	32.00	50.00	60.00
New Orleans, La.	45.00	55.00	65.00
Norfolk, Va.	33.00	46.00	60.00
Passaic, N. J.	42.50	55.00	75.00
Pawtucket, R. I.	27.50	41.25	55.00
Presidio, Tex.	55.00	65.00	75.00
Roanoke, Va.	32.50	40.00	50.00
Salem, Mass.	40.00	60.00	75.00
San Antonio, Tex.	37.00	46.00	60.00
San Diego, Calif.	35.00	44.00	52.50
Spartanburg, S. C.	32.50	40.00	52.50

Prices are for standard sizes—No. 4, size 3½x4x12 in.; No. 6, size 3½x6x12 in.; No. 8, size, 3½x8x12 in. *Delivered on job. †10% discount. ‡Stonetile, per 1000 at plant, 4x6x8, 55.00; 4x8x8, 64.00.

Talc

Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point.

Chester, Vt.—Finely ground talc (carloads), Grade A—99-99¼% thru 200 mesh, 7.50–8.00; Grade B, 97-98% thru 200 mesh 6.50– 7.00

1.00 per ton extra for 50-lb. paper bags; 166⅔-lb. burlap bags, 15c each; 200-lb. burlap bags, 18c each. Credit for return of burlap bags. Terms 1%, 10 days.

Emeryville, N. Y.:
Crude ground talc (200 mesh), bags.. 13.75
Crude ground talc (325 mesh), bags.. 14.75

Henry, Va.:
Crude mine run, per ton 3.40– 4.00
Ground talc (150-200 mesh), in bags.. 4.80– 7.00

Joliet, Ill.:
Ground talc, 200 mesh, in bags:
California talc 30.00
Southern talc 20.00
Illinois talc 10.00

Los Angeles, Calif.:
Ground talc (200 mesh) in bags 15.00–35.00

Natural Bridge, N. Y.:
Ground talc (325 mesh), in 50-lb., 100-lb. and 200-lb. bags, per ton 10.00–20.00

Whiting

St. Louis, Mo., per ton 15.00*

Chicago, Ill., prices per ton.
Domestic putty whiting 10.00–12.00
Domestic precipitated whiting 15.00–20.00
Imported bolted whiting 30.00–35.00

Philadelphia, Penn.—English chalk whiting packed in 50-lb. paper bags, per ton, in carloads 15.00

*Packed in bbl., f.o.b. St. Louis.

Costs and Prices of Ready-Mixed Concrete

THE CHAIN BELT CO., Milwaukee, Wis., has published a booklet, "Costs and Prices of Ready-Mixed Concrete in 20 Plants."

The data was prepared by Fred C. Wilcox. Mr. Wilcox has also written on "Ready-Mixed Concrete, Is It a Good Business?" Many illustrations showing truck mixing equipment are included.

The cost data given appeared in the August 15 issue of ROCK PRODUCTS in an article "Production Data on Ready-Mix Concrete."

Current Prices Cement Pipe

Prices are net per foot f.o.b. cities or nearest shipping point in carload lots unless otherwise noted

Culvert and Sewer	4-in.	6-in.	8-in.	10-in.	12-in.	15-in.	18-in.	20-in.	22-in.	24-in.	27-in.	30-in.	36-in.	42-in.	48-in.	54-in.	60-in.
Grand Rapids and Saginaw, Mich.																	
Culvert (b)	.....	.....	.....	.55	.60	1.00	1.35	1.60e	.....	1.80	2.00	2.25	3.10	.....	.....	.....	.....
Longview, Wash.																	
Culvert	.....	.30	.40	.....	.55	.....	1.10	.....	.....	1.50	.....	2.70	4.25	5.00	.....	.....	.....
Newark, N. J.																	
Unreinforced	.08	.16	.26	.36	.46	.56	.90	1.10	1.26	1.50	.....	.....	.....	.....	.....	.....	.....
Reinforced	.....	.....	.....	.....	.90	1.05	1.40	1.60	1.75	2.05	2.60	3.00	4.00	5.00	6.00	8.50	12.00
Wahoo, Neb.	12-in., 15-in., 18-in., 24-in., and from 30-in. to 60-in. pipe, per ton, 10.00																

(a) Reinforced. (b) To contractors. (e) 21-in. pipe.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F.O.B. MILL

City or shipping point	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco Calcined Gypsum	Cement and Gaging Plaster	Wood Fiber	Gaging White	Plaster Sanded	Cement Keene's	Finish Trowel	—Plaster Board— ⅜x32x 36". Per M Sq. Ft.	⅜x32x 36". Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10'. Per M Sq. Ft.
East St. Louis, Ill.—Special Gypsum Products—Partition section, 4 in. thick, 12 in. wide, and up to 10 ft. 3 in. long, 12c per ft., 21.00 per ton; outside wall section and interior bearing wall section, 6 in. wide. 6 in. thick. and up to 10 ft. 3 in. long, 25c per ft., 30.00 per ton; floor section, 7 in. thick, 16 in. wide, and up to 13 ft. 6 in. long. 17c per ft., 23.00 per ton.													
Los Angeles, Calif. (r)	.....	.....	7.90p	.....	12.20q	.....	13.20a	.....	.....	.....	.....	.....	.....
Medicine Lodge, Kan.	1.40	.....	.....	.....	.....	.....	11.50b	.....	16.00b	.....	.....	.....	.....
Port Clinton, Ohio	4.00	6.00–8.00	6.00–8.00	10.00m	10.00n	10.00n	20.00k	8.00–11.00	24.50f	26.00g	15.00h	15.00h	27.00j
Winnipeg, Man.	5.00	5.00	7.00	13.00	14.00	14.00	.....	.....	.....	.....	20.00	25.00c	33.00d
Woodville, Ohio	.....	.....	.....	.....	.....	.....	.....	.....	25.50b	.....	.....	.....	.....

NOTE—Returnable bags, 10c each; paper bags, 1.00 per ton extra (not returnable. (a) To 14.20 per ton. (b) Includes paper bags. (c) Includes jute sacks. (d) "Gyproc," ⅜x48-in. by 5 and 10 ft. long. (f) To 27.50. (g) To 29.00. (h) To 16.00. (j) To 28.00. ((k) To 23.00. (m) To 12.00. (n) To 13.00. (p) To 8.90. (q) To 13.20 per ton. (r) Plaster board, ⅜x32x36-in., per yd., 16c.

Scrubbing Clay Coated Sand and Gravel and Reduction of Conglomerate Rock and Soft Sandstones

By J. K. Towers
Hardinge Company, Inc., York, Penn.

CLEANING SAND, STONE AND GRAVEL to meet the increasingly strict specifications set up by municipalities, state highway departments, railroads and various industries, necessitates more than ordinary washing and handling of the material.

There is a wide gap between the simple, ordinary washing requirements experienced in some operations and the extremely severe scrubbing necessary in others. Even where some disintegrating of the softer sandstones and foreign materials such as ochre, mica, etc., is necessary, the problem is a simple one compared to the disintegrating of firm clay balls for the release of the pebble or sand as is found necessary in some cases.

Concrete evidence of the range in equipment necessary for the two extreme conditions is found in the flow sheets shown herewith.

Flow sheet "A" is more especially arranged for a sand scrubbing plant where some crushing of the harder mass, say sandstone, ochre, etc., is desired along with the necessary scrubbing of each grain of sand. Some few steel balls are added in the scrubber to accomplish the reduction of the harder particles. Where such harder materials do not occur, the balls are omitted, and in fact, one or the other of the primary crushers, either jaw or dry pan, or both, may be dispensed with.

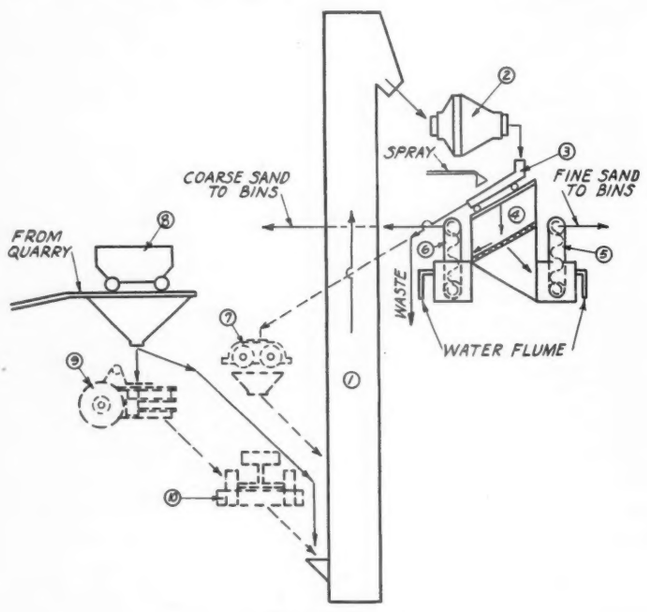
Flow sheet "B" is applied to projects where it is known that as much as 85% clay exists in the mass from which the remaining 15% pebble must be extracted. True enough this may be termed a "large order," and while a 100% recovery is not always possible, nevertheless it is a fact that in more than one instance satisfactory extraction has been accomplished.

For all stages between and including the above noted range of requirements, it is not readily possible to accomplish this work satisfactorily with the ordinary log washers, drags, screws, screens, etc., without excessive maintenance and operating costs and high consumption of water. Where there is considerable clay in the mass, it is almost entirely impossible of accomplishment with such types of equipment. It is known that with 85% clay, the very best log washer operation will not result in a reduction of the clay to under 10%, and screens and drags will not break up the clay balls at all.

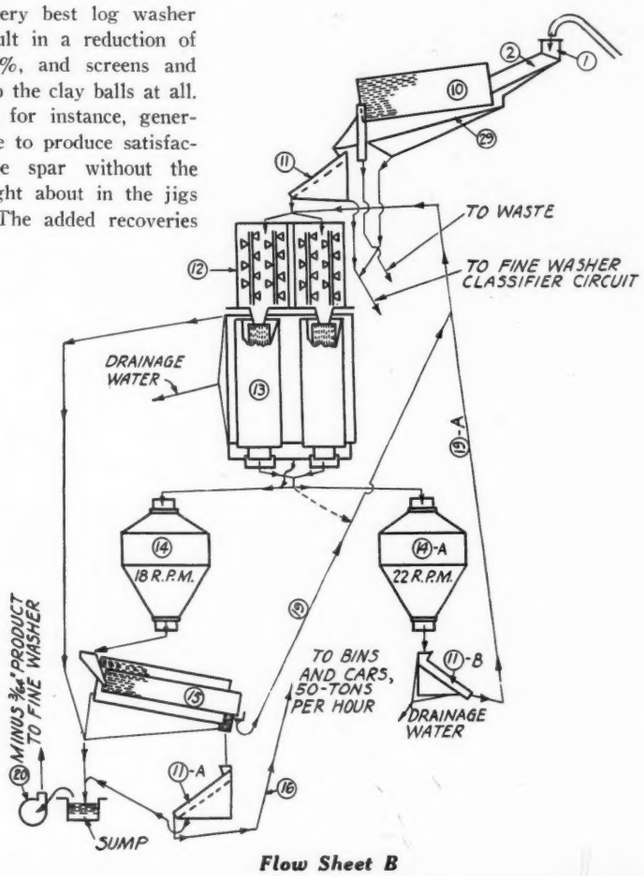
Fluorspar operators, for instance, generally have not been able to produce satisfactory scrubbing of the spar without the further agitation brought about in the jigs used for classifying. The added recoveries possible in the jigs, without the burden of cleaning the softer foreign substance, indicates that better scrubbing ahead of the jigs is desirable and more efficient scrubbers necessary.

A sure method of meeting severe or moderate scrubbing requirements is to provide for a most vigorous rubbing of each particle of sand, stone or other material against the other particles, a rapid turnover of the mass and a definite surging action of the water during this scrubbing and churning action.

In problems of the nonmetallic industries, of which the sand and stone business may be considered a part, much may be learned from the experiences of engineers in the metallurgical field. This is shown in the extensive studies made of the flotation process used for recovering ores, with the result that success is now assured in the application of it in the recoveries of low grade



Flow Sheet A



Flow Sheet B

pebble phosphate. The success of sand classifiers now in use in sand and stone plants was made possible by studies of this type of equipment long used in the mining industry. The continuous thickeners applied to the thickening of ore concentrates for years formed the background of study for the use of them in the thickening or dewatering of cement slurry, kaolin, sewage sludge and other materials. Now of interest to sand and stone producers is the successful use of a modified conical mill (it is desired to distinguish this as a conical scrubber) for the scrubbing of pebbles and sand imbedded in or coated with clay and for the reduction of sandstones, etc., to be sold for use in plaster, concrete, foundry, glass, steel, asphalt and other requirements.

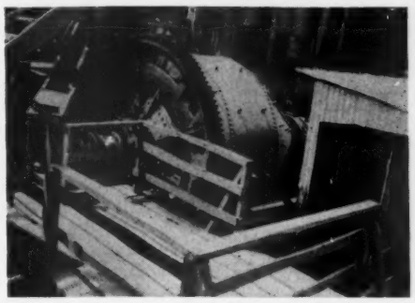
The very function of grinding for which the conical mill has been used in hundreds of cases on ores and nonmetallic minerals, suggested the use of it for scrubbing, since attrition in grinding is after all, nothing more than a rubbing of each particle against another surface or particle.

It may be stated, however, that attrition with the resultant diminishing in size of the particle is not ordinarily wanted in the cleaning of sand and stone, but this is true only in so far as it affects the sand or pebbles, and not the clay which completely surrounds each particle or the ochre, sandstones, etc., found associated with it. An important factor, therefore, is the degree of attrition or scrubbing which is accomplished.

Fortunately, the conical scrubber lends itself readily to a rapid circulation as well as a quick discharge of the mass. The degree of attrition can, therefore, be controlled to suit almost any requirement by the rate of feed to the scrubber. Even the addition of balls may be found desirable in the cases where some crushing of the harder materials is desired.

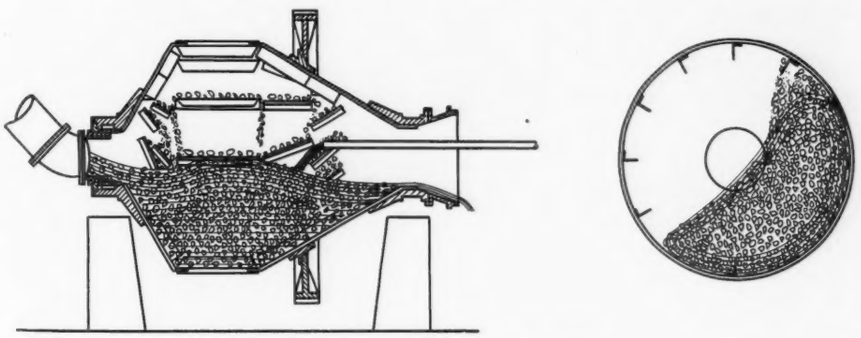
Perhaps the most severe requirement in this respect may be seen in the use of several of these scrubbers in the pebble phosphate districts. Here the demands are for the releasing of the clean pebbles from the firm clay matrix in which it is imbedded with a minimum reduction in the particle size of the phosphate pebble. In replacing a series of log washers, Hardinge conical scrubbers reduced the loss by breakage of the pebbles below the minimum screen limit by 5%. This saving alone, which was accomplished with a total output of 100,000 tons of finished material, resulted in writing off the cost of the conical scrubbers in six months' time. The constant chopping action of the paddles in the log washers resulted in excessive loss of material because of breakage.

Such conditions are met by the use of equipment as shown in flow sheet "B." The short pair of log washers acts only as a capacity control for the plant.



View of conical scrubber

In the Hardinge conical scrubber, the work of cleaning is done not by other agencies such as the paddles in log washers, but by each particle working with the other particles of the mass. The accompanying cut of the scrubber shows how completely every particle of the material in the scrubber receives its share of rubbing. Not only does the mass work from feed to discharge end, but it also, at the same time, rolls over from the high to the low position, as shown in the sectional end view. This gives a parabolic circulating effect that produces a most vigorous scrubbing of every particle.



Sectional views of conical scrubber

But of outstanding importance is the higher speed possible with the conical scrubber (about 30 r.p.m. for a machine 6 ft. in diam.) compared to that of the equivalent diameter revolving screens. The higher speed produces a greater superincumbent weight as a result of the raising of the mass to a higher point in the scrubber. Under such conditions, the crushing action is greater on the softer clay, sandstone, etc., and the more rapid circulation produces a greater degree of scrubbing. A natural cascading action also takes place due to the speed at which the scrubber is run, and this obviates the necessity of providing extensive lifters which are always a source of trouble and high maintenance cost.

The crushing force of the mass at the large diameter assures complete breakage of large clay balls. Their reduction to slime by the time the end of the mill is reached is brought about by the rubbing of the harder material against the softer clay. The more rapid passage of the smaller pebbles or sand toward the discharge end follows as a result of the cone shape which produces a natural classifying effect. This action also causes the voids to be filled, permitting definite contact of all surfaces at some time during the passage through the machine.

These factors and the absence of moving mechanical parts within the scrubber assure almost negligible maintenance, low power, and a minimum quantity of water required. Power consumption on this scrubber amounted to 60 hp. as against 90 hp. for the log washers which it replaced.

While considerably higher speeds are possible with the conical scrubber than with revolving screens, the rugged bearing and driving construction is similar to that of the conical ball mill which in the grinding field is considered a slow speed machine. Such construction permits continuous operation of the scrubber 24 hours per day. In the metallurgical field these mills have been known to run continuously without shutdown for over a year which is evidence of the almost negligible attention required for this rugged type of construction.

In grinding ores to a pulp, the dilution in the Hardinge mill normally runs about 35 to 50% water, with the balance solids. This is an indication that with the mass, even in pulp or thick slurry form, a satisfactory discharge or flow through the mill is possible with low dilution. However, where the material does not take the form of a pulp, the dilution rate might be very much less and still permit a free flowing mass. This is more especially true with respect to gravel than with sand, but considerably less likely where the percentage of clay in the mass is high. However, even under the extremely severe conditions in the pebble phosphate district with the mass containing only 15 to 20% recoverable pebble, the dilution is not over 75%. These operations show 50% less water used with conical scrubbers than with log washers.

The September 27, 1931, issue of Rock Products contains an interesting article concerning the aggregate industry in Kansas City, Mo., territory. It clearly shows why the many plants pictured have fallen to ruin and abandonment because of changes in the industry which require better methods of handling materials and the strict requirements now imposed upon the producers of sand and stone.

It is the desire of the writer to point out better ways of accomplishing results in this

field and it is believed that producers will benefit by a study of the possibilities of the scrubber described above for their particular requirements. This is of special interest in some sections of the country, particularly in New York state, where the highway department has revised its specifications for 1932 concrete pavement to require cleaning of all stone aggregate. This is commented on by Edmund Shaw in his interesting article covering the principles of washing as applied to crushed stone (Rock Products, October 24, 1931). It is understood that New York state will consider dry cleaning if properly accomplished, but nevertheless the producer of well scrubbed stone and sand will doubtless have considerable advantage over those who may secure fairly satisfactory results in other ways.

Claim New Type of Waterproof Paper Bag

INTERESTING information comes from H. W. Bennett, owner of Tung Acres east of LaCrosse, Fla., to the effect that new markets are opening up for tung oil.

An important development is that credited to H. R. Brown and J. C. Ward, chemical engineers of New York, who have patented a process of combining powdered asbestos—7 to 60% according to materials to be treated—with tung oil for waterproofing, insulating and toughening. A demonstration of what this process means in creating an enormous demand for Florida's tung oil, has been provided by treatment of 3000 six-ply paper bags—one-ply coated—carrying 100 lb. each of Chilean nitrates. These bags stood shipment from Chile to New York without air penetration. As a result of this success, these interests alone, according to Mr. Bennett, plan to use 50,000,000 bags annually. Cement manufacturers, it is estimated, could use 300,000,000 bags.—*Gainesville* (Fla.) *Sun.*

Report of Bureau of Foreign and Domestic Commerce

THE ANNUAL REPORT of the U. S. Bureau of Foreign and Domestic Commerce for the year ending June 30, 1931, has been issued.

In summarizing the major activities of the minerals division, none of which applied to the rock products industry, the report said:

"During the fiscal year 1930-31 two phases of activity developed to a point that signifies a definite trend and consequently may serve to influence the future policies of the minerals division: (a) the need and demand for assistance in analyzing problems pertinent to domestic marketing or distribution of manufactures, and (b) the requests from governmental and trade organizations for aid of an advisory character with respect to current conditions abroad, constitute fields in which the division has been occupied actively during the past year.

Heads Fairbanks, Morse and Co.

ACCORDING to an announcement by Fairbanks, Morse and Co., Robert H. Morse, formerly vice-chairman of the board of directors, has been elected to the positions of president and general manager to succeed W. S. Hovey, following his resignation December 1.

At the close of the board meeting, at which this action was taken, Mr. Morse issued this statement:

"The company has a history of successful operation over a period of 100 years and we look forward with confidence to its continued success. Our plans for the future are based on the possibility that there will not be an immediate general upturn in business and we are prepared to meet that kind of a market."

R. H. Morse

Robert H. Morse was born in Chicago, Ill., December 6, 1878. In 1895 he entered the employ of Fairbanks, Morse and Co., the firm founded by his father, C. H. Morse. Here he began his career with the company as an apprentice at the Beloit factory and, except during his military service, when he was lieutenant-colonel in the signal corps, has been with the company continuously since that time. In the 36 years he has been employed in various positions as salesman, department manager, branch house manager, sales manager, president of the manufacturing division, vice-president in charge of purchases, first vice-president, vice-chairman of the board and now president and general manager.

Mr. Morse is also a director of E. and T. Fairbanks and Co., The Canadian Fairbanks-Morse Co., Ltd., E. and T. Fairbanks Co., Ltd., and Central Republic Bank and Trust Co.

Ordinance Requires Sales by Weight

AN ORDINANCE requiring all sales of crushed rock, sand and gravel in Minneapolis, Minn., to be made by weight, rather than by volume, has been submitted to City Attorney Cronin for examination, in preparation for its submission to the city council at its next meeting.

The ordinance was recommended for passage, contingent on the attorney's approval, by the council committee on ordinances and legislation. The measure is expected to clear up difficulties gravel producers have experienced recently in delivering full-measure loads, measured in cubic yards, without violating regulations against overloading. In several instances truck drivers, who one day were arrested for delivering short-measure loads, were haled into court the next day for carrying more than the maximum of 28,000 lb. allowed by state law.

Representatives of the Rice Sand and Gravel Co. and operators of several smaller plants, objected to passage of the ordinance, claiming the expense of installing scales required by the ordinance, the time involved in weighing loads and in calculating the moisture content would raise production costs unreasonably. They claimed all companies could haul full 5-yd. loads without overloading, if they used lighter trucks.

Representatives of the Hedberg-Friedheim Co., the Landers-Morrison-Christensen Co., and the John Wunder Co. favored the ordinance. Sale of sand, gravel and crushed rock by weight is the only means of assuring the customer he is getting what he pays for, they said. Use of lighter trucks to allow delivery of full yardage without overloading is not feasible, they said, since only heavy trucks can be used economically.—*Minneapolis* (Minn.) *Journal.*

To Build New Lime Plant

THE NEW LIME COMPANY that is being opened at Illmo, Mo., known as the Ill-Mo Lime and Marble Co., has completed its deal with Giborey Houck for the limestone on the land known as the Stone farm. A siding will be built from the Frisco. The quarry will be opened up at once. The stone will be trucked to the kilns which will be built on the Cotton Belt tracks at Froemsdorf.

One or two kilns will be built and work started at once, each kiln to have a capacity of ten tons of lime a day.

J. H. Dolan will probably be superintendent of the plant.—*Illmo* (Mo.) *Jimplicute.*

Increasing the Pay Load With Light-Weight Truck Bodies

By H. M. Fitch
College of Engineering, University of Illinois

PRESENT DAY COMPETITION has placed such a pressure on modern business that operators in all fields have found it an absolute necessity to obtain the maximum of service from the equipment at hand as one means of keeping the ledger accounts out of the dangerous red. This seems to have been particularly true in the rock products industry during the present season, as operators throughout the country are carefully checking their figures in order to cut expense here or increase service there.

An interesting experiment in getting the most from equipment is being conducted by the Manegold Stone Co. of Milwaukee, Wis., in the use of two delivery trucks with aluminum dump bodies. Simply stated this is not really an experiment at all, but a very simple arithmetic problem. Given a definite gross load limit fixed by the state law, the lighter the body the heavier may be the pay load carried, and the saving in truck miles by use of the larger load can be computed.

The Manegold company operates a quarry within the city limits of Milwaukee, so that it is subject to city as well as state regulations. The present Wisconsin automobile code went into effect in November, 1929, and by this code trucks are permitted 24,000 lb. gross load on two axles, but this is increased to 36,000 lb. when the truck has three axles. Mr. Manegold found it necessary to buy two more trucks for his quarry last year, and he naturally decided on the 3-axle type, in view of the new regulations. The decision on whether aluminum or steel bodies should be used was reached in favor of the former after a careful analysis of the market and the savings that could be expected from the lighter body.

The aluminum trucks weigh 13,500 lb., which is a saving of approximately one ton over the same capacity in the steel body. This means that it is permissible to haul an extra yard of stone on each trip, the aluminum body carrying 9 cu. yd., while the steel body can only carry eight. The aluminum bodies cost about $1000 more than the steel bodies so that this expense must be offset by the saving in operating cost. The sum of $1000 is somewhat reduced, however, since aluminum has a salvage value that steel does not, and an aluminum body, as junk, would be worth around $150, so that the net cost of the body is actually that much lower than the apparent cost.

In speaking about the new trucks, Mr. Manegold said he would rather he "hauling stone" than "losing his shirt" on unproductive long deliveries with an extra ton of truck on the back instead of a ton of pay load. The truck owner who does not figure his truck replacement cost into his total delivery cost will not be with us for long, he said, but such an operator can cause plenty of trouble for the industry during the time he does operate. It is such competition, perhaps more than any other factor, that persuaded the Manegold company to invest in the new trucks.

The Manegold trucks were manufactured by the Sterling Motor Truck Co. of Milwaukee, and the aluminum bodies were made by the Heil Co., another Milwaukee manufacturer. As previously stated, they have three axles, the two rear axles having double wheels, so that 10 tires ride the road, a provision necessary since the Wisconsin code allows a maximum of 800 lb. per sq. in. road pressure. The bodies have been left in natural aluminum finish with the company's name painted in gold on each side. The whole layout makes an attractive and noticeable unit, and one that is bound to catch the public eye and receive favorable comment. The advertising value of this can only be estimated, but there certainly is some benefit derived. On the more tangible side, the upkeep is reduced on these trucks because they do not have to be contiually painted to preserve them and to keep up appearances. Although painting has been found necessary on some aluminum truck bodies because of the action of salt sea air, this of course is unnecessary at Milwaukee, far from any salt air.

With name painted in gold on the aluminum body, an arresting result is obtained

While no figures are yet available on the Manegold trucks, a similar operation in Pittsburgh can supply some idea of what can be expected in operating costs. The following data are from an issue of *Truck-O-News*, the publication of the Wisconsin Truck Owners Association: In the operation mentioned there was a fleet of 14 trucks of 6½-yd. capacity used for delivering sand. The estimated weight saving made by the use of aluminum was 1500 lb. per truck, which was thus available for additional pay load. The average round trip mileage was 45 mi. and the average number of trips was 12½ daily. The possible load with a steel body would have been 12,000 lb., and hence 13,500 lb. was the possible load with the aluminum body. It required 8 days' work with the aluminum body truck to gain one day overwork with the steel body, and figuring 200 working days a year, this means a total of 25 days gained each year. With the daily operating cost at $25 per day, this means an operating saving of $625 per year. In this case the additional expenditure for aluminum was $537, so that the additional cost was returned completely within a single year, and the return on the investment was 116.5%.

It is true that these figures would mean little if the life of such a truck were only a single year, but it is claimed that aluminum can compete successfully against steel in the matter of wearing qualities as well as operating economy. This has been demonstrated by the Manegold trucks, which, after a year of operation, show no appreciable wear and are in excellent condition throughout.

Enlarging Talc Plant

THE NOTLA TALC CO., located six miles west of Murphy, N. C., is enlarging its plant. The company is prospecting its property by diamond-drilling, and has found additional deposits of high grade talc.

Business has been on the increase for the past three months, according to the manager, J. W. Bailey. The Notla Talc Co. is owned by the Binney and Smith Co. of New York. —*Asheville* (N. C.) *Citizen.*

New Machinery and Equipment

Portable Sump Pump

A PORTABLE, centrifugal sump pump, the Cleco-Deming pump, bearing a number of exclusive features has been announced by the Cleveland Pneumatic Tool Co., Cleveland, Ohio.

Exclusive features claimed for the C-D pump, as it will be known, include economical operation through a saving in air consumption; it is compact with a low center of gravity that prevents it from being upset; and it has an oil reservoir capacity of unusual size.

Production of the pump involves collaboration of the Deming Pump Co. of Salem, Ohio, which supplies the pump and the Cleveland Pneumatic Tool Co., which provides the motor and will merchandise the unit.

The Cleco-Deming pump is adapted for service wherever liquids accumulate and compressed air is available and has the operating power unit built integral with the pump housing, making a portable outfit which can be handled by one man.

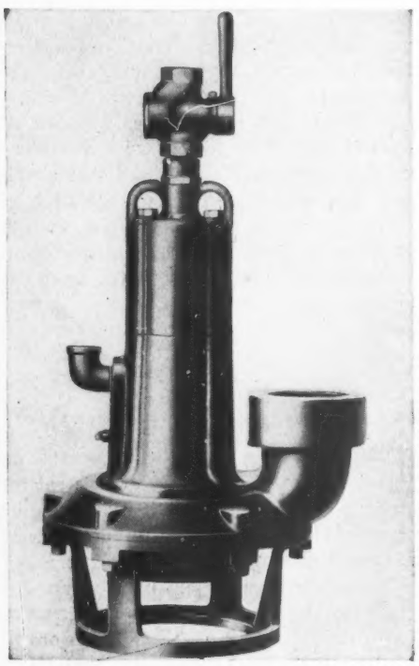
The motor of the pump is operated by compressed air and is automatically lubricated from a reservoir located in the cylinder body.

The pump performs while entirely or partially submerged, and functions efficiently in either position, the manufacturer states.

The air consumption is from 15 to 20 cu. ft. per min. less than any similar type of rotary pump, the manufacturer claims.

With a 20-ft. head, the capacity of the C-D pump is 142 gal. a min. at 90 lb. air pressure and 137 gal. a minute at 80 lb. air pressure.

The unit weighs 36 lb.



Pump powered with compressed air

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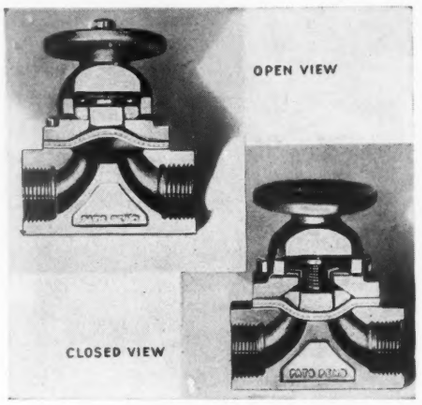
Valves

THE Hills-McCanna Co., Chicago, Ill., announces it has acquired manufacturing and sales rights on a new type of valve.

The valve has no metal to metal seats, no stem packing or stuffing boxes, and is recommended for general service, the manufacturer states, and the materials handled never reach the valve bonnet. It is also claimed the diaphragm protects all the working parts from the substances handled. Access to the bonnet or body does not require removal from the line.



Metal seats and packing are eliminated

According to the manufacturer, corrosion resisting valves of any commercial material are priced in the range of iron valves due to the design that requires only the body to be cast in special metals.

In the closed position the diaphram is compressed between the compressor follower and the seat.

•

Electric Air Heaters

A LINE of horizontal electric air heaters for industrial applications is announced by the General Electric Co., Schenectady, N. Y. Five ratings are listed: 1000 watts at 115 volts; and 1000, 2000, 3000 and 4500 watts at 230 volts.

The heaters consist of a number of General Electric strip heaters mounted in black japanned, perforated, pressed steel cases. Each is equipped with 3 ft. of armored cable and a three-heat snap switch mounted on a standard conduit box. They are designed for wall or floor mounting.

Advantages of the new line, as listed by the manufacturer, are: (1) Free air circulation, providing maximum heat; (2) ease of installation—the heaters are simply mounted on wall or floor and connected to the power line; (3) lightness and strength—units are easily moved from one job to another; (4) heat is always available at the turn of a switch; (5) the three-heat snap switch provides simple regulation of temperature and economy of operation; and (6) cleanliness—no soot, dirt or dust, no odors or obnoxious gases.

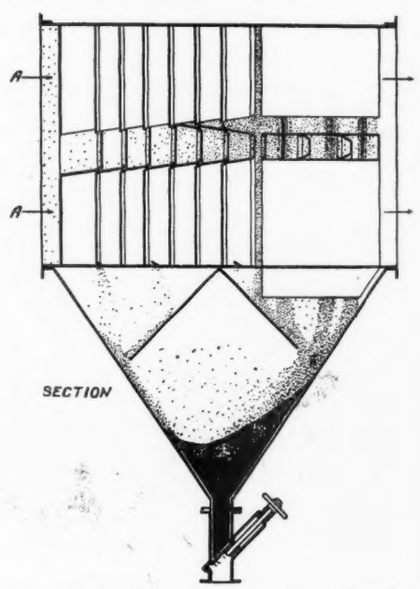
•

Cinder Catcher

THE "VORTEX" cinder catcher is manufactured by Dust Recovery, Inc., New York, N. Y. This cinder catcher is said to operate on the same principle as the Vorticose dust collector, used for the collection of cement, talc and other fine dusts, described in a previous issue of Rock Products.

The collecting elements are made of plates to withstand the abrasive characteristics of cinders, the manufacturer states. This cinder catcher contains no internal or external moving parts.

An advantage of this apparatus is that no turbulence exists in the settling chamber, which results in the precipitation of a high per cent. of fine ash as well as the coarse cinders, the manufacturer states.



No turbulence exists in settling chamber

New Sizes of Motor Pump

A NUMBER of new sizes have been added to the Cameron line of small general service centrifugal "Motorpumps" manufactured by Ingersoll-Rand Co., New York City. These pumps are now made in 1-in. discharge and upward.

Pump and motor are assembled as a single

No foundation or baseplate is needed

unit with a common shaft, producing a compact, light weight pump. No foundation or baseplate is needed. The discharge nozzle may be turned to any one of four positions.

There are only two bearings. These are of the ball type. There is but one stuffing box. The impeller is made of bronze and is hydraulically balanced. Renewable bronze wearing rings and shaft sleeve are provided.

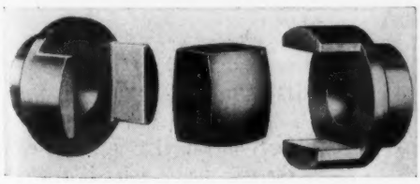
The manufacturer states these pumps may be used against moderate heads for a great variety of services, such as in circulation systems, air conditioning equipment, stand pipe and water supply systems, condensate return systems, and general transfer service handling a wide variety of liquids.

The pump may be obtained in various motor combinations for all ordinary current conditions and for use in hazardous locations.

●

Small Flexible Couplings

A RECENT ADDITION to the line of flexible shaft couplings, manufactured by the American Flexible Coupling Co., Erie, Penn., includes two small sizes with maximum bores of ¾ in. and 1 in. and designated Nos. 4 and 6 respectively.



For fractional horsepower needs

The power capacity is 0.05 hp. per 100 r.p.m. for the No. 4 and 0.15 hp. per 100 r.p.m. for the No. 6. The weights are ¾ lb. and 2 lb. respectively. Both sizes permit a maximum parallel misalignment of 1/64 in. and a maximum angular misalignment of 1 deg., the manufacturer states.

●

Announces Line of Products Handling Equipment

THE CLARK TRUCTRACTOR CO., Battle Creek, Mich., announces it has just completed a new line of gas powered Clark "Truclifts" and Clark "Tructiers" embracing eight new models of four-wheel-steer, rear-wheel-drive Truclifts, platform and finger tiering machines.

It also announces it is now seeking new devices, preferably in the material handling line, that it can develop and put into production.

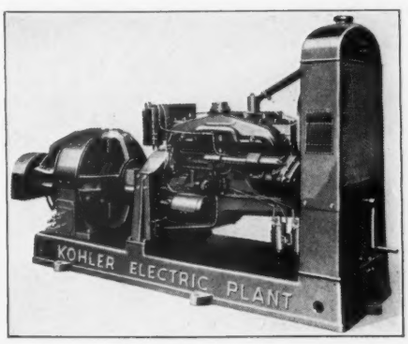
Briefly, devices should fit into the following category: (1) Should have large field of usefulness, requiring reasonable quantity production; (2) should be suitable for manufacture in a plant with complete modern equipment, including steel foundry; (3) labor saving should justify purchase price; and (4) simplicity of design and operation would be a desirable factor.

This manufacturer says any device submitted that will meet the above conditions will receive full attention.

●

Electric Plants Have Doubled Capacity

TWO NEW KOHLER electric plants, each of which offers twice the capacity of any of the 100 other different models in this line of portable, automatic power and



Portable and automatic unit

light units, are announced by the Kohler Co., Kohler, Wis.

Twenty kilowatt direct current and 25 k.v.a. alternating current are delivered, respectively, by the two new plants.

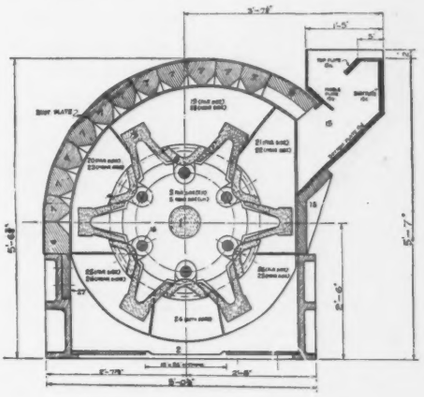
The new plants are powered by six-cylinder heavy duty industrial engines of the L-head type, with removable cylinder heads. Cooling is by means of a large size radiator and water circulation pump.

Standard 110 or 220 volt current is generated by the new plants.

●

British Impact Crusher

A NEW CRUSHER is described in the British journal, *Crushing and Grinding* for October. The description says that it is especially adapted to making concrete



Impact does the crushing

aggregate from stone and slag because it produces, "nicely sized cubical pieces with a minimum of dust and smalls." It resembles the ordinary hammer mill in appearance but the crushing is not by blows of the hammers. These serve only to throw the rock against the heavy bars with which the outside casing is lined and the impact breaks the rock. Neither the cut nor the description shows any screen or grating for regulating the size of the product. The makers claim that rock may be reduced from 6-in. pieces to any grade of product between 2-in. to ⅜-in. sizes by merely varying the speed of the machine.

●

Protective Coating for Steel

A PROTECTIVE COATING for preventing corrosion of power plant equipment is manufactured by the Dampney Co. of America, Boston, Mass.

According to the manufacturer this product will withstand the high pressures, temperatures and ratings now common in practice, will not cause heat retardation, is easily and quickly applied, adheres well to metal surfaces, and is inexpensive.

A small quantity is applied, after the surface has been thoroughly cleaned, and brushed to cover the entire surface. A Powercoater is available for brushing boiler and economizer tubes mechanically.

In the sand-lime brick industry this coating, Apexior No. 1, has been used in the interior of steel steam kilns and is reported to have eliminated discoloration of bricks due to rusty condensation dripping from the top of the kiln. For such application it is recommended that one coat be applied each 12 or 15 months.

A Development in Metal

By R. Drant
Banner Iron Works, St. Louis, Mo.

THE effects of abrasion, corrosion and heat on cast iron are well known and need no introduction to the engineers in the cement and crushing industries who have long grappled with these factors in their endeavor to reduce the annual toll taken by them. Their efforts have resulted in some degree of relief through improved manufacturing equipment with increased plant production, but the demand for a superior casting material to combat the above factors has likewise increased in proportion to the results obtained.

Cast iron, although it has come in for a large share of the annual replacement tonnage in cement and crushing plants, has not kept abreast of the increasing demands brought upon it and in the last few years large inroads have been made on the applications of this metal by the substitution of higher priced materials.

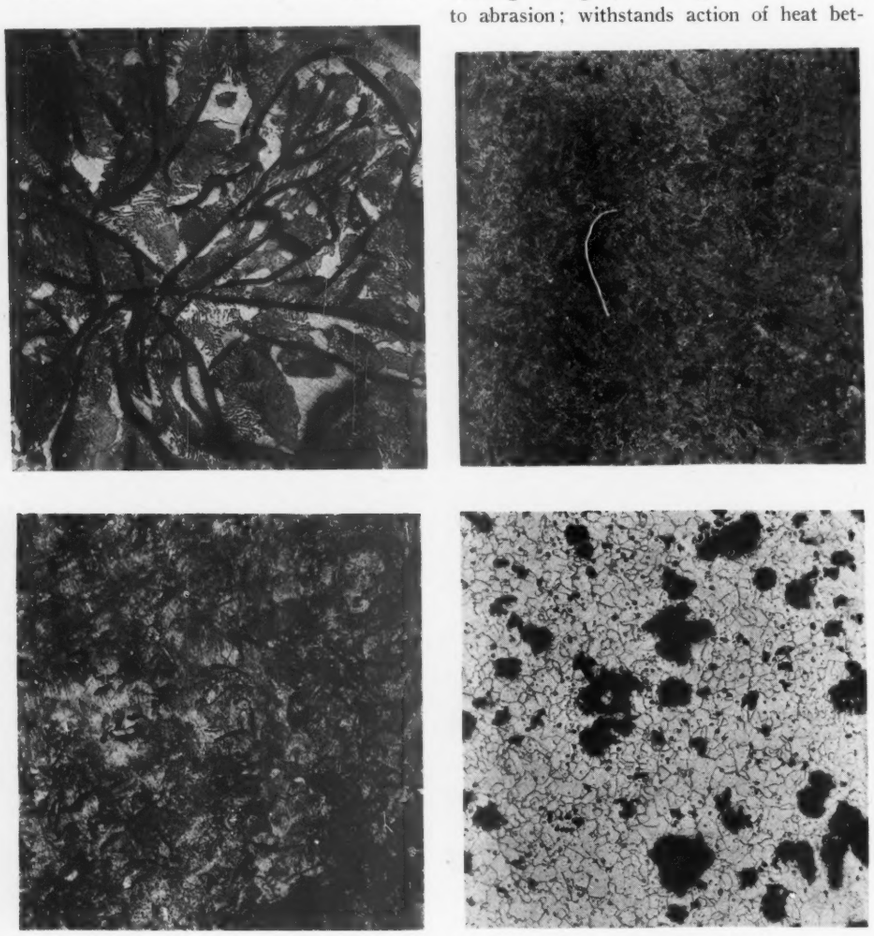
The demand for a superior metal that would be more economical and versatile in its application attracted the attention of G. F. Meehan and resulted in the development of "Meehanite" metal. Although a comparatively recent introduction, "Meehanite" metal has been used in cement and crushing plants for several years during its period of development and today is attracting considerable interest due to the economical advantages claimed for it as well as the versatility of its application to the requirements of these trades.

"Meehanite" metal combines a uniformly dense grain structure regardless of section, with rigidity and toughness, though it is readily machineable. Due to its unusual properties it can be cast against a chill or hardened by quenching in oil or water.

"Meehanite" metal is not an alloy and is manufactured to exact physical specifications, depending entirely upon the particular service application of the requirement at hand. Likewise, the analysis of the metal is specified according to the service intended. The fact that it is specified according to exact physical properties as well as definite chemical analysis has contributed largely to the success of this metal made by the "Meehanite" process.

The advantages claimed for "Meehanite" metal over grey iron or semi-steel are: Over twice the tensile strength; more than six times the impact strength; twice the bending strength; much greater resistance to abrasion; withstands action of heat better; twice the tensile strength of cast iron at red heat; greater density; uniformity of hardness and strength in heavy and light sections; much higher resistance to corrosion, acids and alkalis; cleaner machined surfaces and higher polish; uniformity of grain structure regardless of section, and much tougher wearing chill which does not chip or spall.

Castings in the cement and crushing industries for which "Meehanite" metal is suitable and for which exceptional service is claimed include pumps, gyratory crusher heads and liners, cone crusher heads, crusher jaws and liners, tube mill liners, screen plates, mullers, concaves, clinger chutes and many other parts.



Above—At left, cast iron heterogeneous structure with large graphite plates. At right, .85 carbon steel, matrix completely pearlitic. Below—At left, "Meehanite," matrix pearlitic with nodules of graphite. At right, ' Meehanite," annealed, showing nodular graphite

Adds New Lines

THE WELLMAN Engineering Co., Cleveland, Ohio, announces that it has acquired by purchase, the clam-shell bucket and heavy duty trailer business of the G. H. Williams Co. of Erie, Penn., including its good-will, drawings, patterns, inventions, patents, etc., and that the engineering, manufacture and sale of Williams buckets and trailers will be immediately transferred to the Wellman plant in Cleveland.

The G. H. Williams Co. has been in business for some 30 years and is one of the oldest builders of the clam-shell type of material handling buckets and is said to be the originators of the power arm type. The Williams line is complete from the light bucket for fastest rehandling, to the heaviest types, and for every kind of hoisting equipment.

The Williams heavy-duty "arch girder" type of trailer is built in capacities from 5 tons to 60 tons and larger and it is reported their production has doubled during the present year.

The Wellman Engineering Co. announces that W. C. Swalley, secretary and general manager; A. J. Lichtinger, assistant manager; C. F. Weiblen, sales manager; and P. T. Robin, chief engineer of the G. H. Williams Co. at Erie, will be associated with the Wellman company at Cleveland in the manufacture and sale of this equipment.

These two lines will continue to be marketed under their trade names, "Williams bucket" and "Williams trailer," and the "Williams bucket" makes an important addition to the type heretofore built by the Wellman company.

Find Large Salt Deposit

A VAST STORE of rock salt in almost pure state is a late discovery in the search for deep oil production in the south Arkansas fields. The salt bed was penetrated at the Hays deep well of the Lion Oil Refining Co., east of Smackover. The crew has drilled through more than 1200 ft. of salt formation.

Market Trends in Sand and Gravel Industry*

By V. P. Ahearn
Executive Secretary, National Sand and Gravel Association

THE FUTURE, especially for the sand and gravel industry, contains too many variants to permit of my predicting with any degree of certainty just what our market conditions will be in 1932. It is possible for one to put his finger on a number of basic elements which control the production and marketing of sand and gravel, and to draw from them, perhaps, some reasonable expectations for the future. I shall not attempt to do more than that.

There is no construction project which does not require the use of one or both of these materials—from the lowest type of improved road to the finished cement concrete pavement, and from the humblest home to the most majestic office building or railroad terminal. Some idea of the importance of the sand and gravel industry as a user of railroad facilities may be gained from learning that it ranks fourth in volume among commodities handled by the carriers, and stands ninth on the list from the standpoint of revenue which they bring to the railroads, its superiors in this group being, in every instance, commodities which do not load as heavily in the car or which move for much longer distances.

A Billion Dollars in Sand and Gravel in Eleven Years

During the last eleven years, more than 1,700,000,000 tons of sand and gravel, valued at $1,076,311,352, have been produced in the United States. That is certainly an overwhelming figure and it literally staggers the imagination. If we continue to produce sand and gravel at the same rate in the future, inevitably we shall be confronted with the exhaustion of our resources in many sections of the country. It would be imprudent under these circumstances to dissipate the existing reserves in a mad scramble for production records, for volume of business alone is no criterion of sound management.

There is nothing to be gained from denying that one evil which has attended the rapid expansion of our industry in the post-war years is the conviction of the inexperienced that a sure road to quick and easy profits was to engage in the production of sand and gravel. Many went into the business without adequate knowledge of the hazards which beset every operation, and in a great many of these cases grief has been the only result. So long as the demand exceeded the supply, the ultimate complications could not be seen. An immediate result of this was further investment in plant facilities without rational consideration of the market in the future and its ability to absorb the output. It needed only a lean year like 1930 or 1931 to prove that intelligent operation and proper financial resources are just as necessary in the sand and gravel business as in any other business. Unrestrained development of production facilities has brought about a potential capacity far in excess of the requirements of the country, and there must be a readjustment. There was a time when we needed only to concern ourselves with the problems of production, for there was a surplus of customers demanding our materials and each individual producer could pursue his own interests without any real resistance from the outside. That bonanza period in our history has gone, and it will never return.

Need of More Orderly Competition

With our excess capacity have come problems of intelligent merchandising, sane competition, and others of like nature which are common to industry in general. We are not losing sight of the fact that healthy price competition is a most desirable thing, but we have learned that disorderly competition is a destructive force.

Free competition, up to a certain point, promotes efficiency and benefits the public, but when any industry begins to sell its product for less than operating cost, there is economic warfare which is certain to result in lower quality, inefficient service and general chaos. When this happens, the consuming public is the ultimate sufferer. There can be only one cure for such a condition, and that is a fixed adherence to the policy of quoting of prices based upon actual cost plus a reasonable profit. That does not involve elaborate price-fixing in the slightest degree, for time and experience have shown that this is uneconomic and unworkable.

Predicted Production in 1931

While we can do no more at this time than to make an intelligent estimate, it is our feeling that in 1931 the production and value of sand and gravel sustained a further decline of about 20% as compared with production in 1930.

Of course, the sand and gravel industry has some cause for consolation in the fact that the demand for its products is positive in character, and while a project may be postponed, it cannot be entirely canceled. We have three principal outlets: highway work which, in 1930, absorbed more than half of our output; structural building, and railroad ballast. The heavy decline in these two latter markets more than offset the increase in sand and gravel requirements for highways last year, but this sub-normal activity means that we are accumulating a reservoir of demand which is certain to express itself at some time in the immediate future.

For the United States as a whole, there are 957 companies in the sand and gravel business operating 1165 plants. Throughout the year they furnished employment for 191,926 men and women. Labor costs amounted to $33,526,228, or about 33 cents of every sand and gravel dollar.

Where Contractor Can Help

We believe we have sufficient stamina in the sand and gravel industry to stabilize our business, keeping in mind that it is within the industry that we must look for correction of the weaknesses in our system. We do not for an instant think that we have a monopoly of troubles or that we have unusual grievances against other industries because of their unfair trade practices. Most assuredly, we have no greater hazards to overcome than the contractor who is forced to combat some highly speculative elements before he emerges from any job with a profit. You are often faced with contingencies which defy anticipation, particularly in the matter of what you will have to pay for labor, and what that labor will produce. The stock speculator may close out and take his loss when he sees the market is against him, but the contractor must stand his loss until he completes his job. Otherwise, as one prominent member of your profession pointed out, your bond is forfeited and your reputation as a contractor is gone.

I have emphasized that we have a full appreciation of your difficulties in order that I might introduce in an appropriate way one particular problem of ours which involves the highway contractor. I am referring to the practice of some contractors who shop around for their sand and gravel after they are awarded a contract in bidding for which they have used the quotation of a producer. Something closely akin to this is the requesting of a special sand and gravel price in bidding for highway work; in other words, a price concession which places the particular contractor in a more favorable position than his competitor enjoys. The result is

*Extracts from an address at eighth annual convention of Indiana Highway Constructors.

a destruction of confidence and the generation of ill feeling which does great damage to highway contractors and to sand and gravel producers.

We are not contending that the elimination of this evil practice rests solely in your hands, and we acknowledge our share of the responsibility. We know that you are as anxious as we are to avoid favoritism in price quotations, and I have the authority to say that it is our earnest desire to cooperate with highway contractors in curing this sore spot. There is a distinct interdependence between prosperity in the sand and gravel industry and profitable operations in the construction of highways. You cannot discharge your obligations unless we and the others who furnish materials are constantly equipped to give you efficient service and a quality product. Price demoralization deprives us of our ability to meet your demands in this regard, and if the existing conditions are further aggravated and no joint action is taken to afford speedy relief, there will be a drastic economic loss which can never be recovered.

Announce Speakers for Sand and Gravel Association Convention

TWO SPEAKERS, Col. Willard T. Chevalier, publishing director of the *Engineering News-Record,* and H. W. Heinrich of the Travelers Insurance Co., are among those who will address the annual meeting of the National Sand and Gravel Association to be held in Pittsburgh, January 27-29, it is announced.

Colonel Chevalier will speak on the construction industry in its entirety and Mr. Heinrich will talk on safety and its economic influence.

Makes Unbreakable Glass of Nebraska Sand

THE FOLLOWING story has appeared in the *Omaha* (Neb.) *World-Herald* and is most interesting: "A Nebraskan, traveling in Germany, noticed in a beer garden that the old-fashioned stein had been succeeded by a clear, thin glass container. He was surprised to see, when one of them fell to the floor that it did not break. He was interested. He inquired of the waiter what kind of glass it was, and was surprised to learn it was made from a special sand quartz imported from a place in America called Nebraska. Later at a glassware factory he confirmed the statement of the waiter and was shown receptacles in which the sand came from Woodlake, Neb.

"Query: If German manufacturers can take Nebraska sand and make it into unbreakable glassware is there any valid reason why such glassware cannot be manufactured in Nebraska and save all the expense of costly transportation?"

Start Washington Gravel Deposit Development

THE DEVELOPMENT of Hat Island, Wash., sand and gravel deposits as a source of Puget Sound building material, has been started and will be completed in 90 days at an approximate cost of $75,000, Alec Thompson, successful bidder for the preliminary construction work, announced recently.

The work is being done by the Hat Island Sand and Gravel Co., in which Richard Effendahl and George Carey, both of Seattle, are the principal stock owners. F. T. Sherman, also of Seattle, is the consulting engineer for the company. He estimates that the deposit will be sufficient for a 20-year supply.

The gravel deposit has been found satisfactory both in amount and in quality. Top soil is 2 ft. in depth and easily removed.

Excavation will be carried out entirely by the use of a gravity system. Washed from the deposit, gravel will flow into the bunkers and then be loaded into barges by a belt conveyance.

Persons interested in the project assert a cheaper supply of building material will be made available to Everett through the proximity of the island. The present supply necessitates a 142-mi. round trip by scows. Hat Island is only 3½ mi. from Everett.

Ultimate plans of the company include construction of an up-to-date mixing plant in Everett with complete distribution facilities.

Power to be used at the pit will be furnished either by electricity obtained from Everett, or through a generating plant installed on the island.

The land on which the gravel will be obtained was originally owned by the Puget Sound Tug and Barge Co. Test holes sunk about four weeks ago showed gravel deposits ranging from 70 to 100 ft. The company owns all but about 178 acres of the island.

A call for bids on machinery needed in the plant has been issued by the Hat Island company. No definite date for starting commercial production has been set. It is understood, however, that the pit will be producing in early spring.—*Everett* (Wash.) *News.*

Issues Preliminary Program of Road Builders' Convention

A FOLDER has been issued giving a complete program of the 29th annual convention and road show of the American Road Builders Association to be held in Detroit, Mich., January 11-15.

The folder also includes a list of manufacturers who have selected space for the exhibition of their products.

Push Work on New Plant of Construction Materials Corp.

WORK on the new plant of the Construction Materials Corp., at Grand Haven, Mich., is progressing rapidly and will be pushed during the winter. It is expected about 50 men will be employed, as there is considerable to do to get the big plant in readiness for the spring season.

The old wooden plant which lies east of the new steel plant will be torn down this winter and work on it will start as soon as the gravel brought down from up the river is disposed of.

Plans are being made for office buildings and cleaning up of the yards which will make this one of the most complete gravel outfits in the country.

The framework of the tramways, and elevators are all being encased in steel sheeting which is adding to the $1,500,000 expansion program which was instituted over a year ago.

The capacity of the new plant will be many times that of the old one and 1,000,000 tons of gravel is expected to be taken out next year. Several large contracts have recently been secured by this company.—*Grand Haven* (Mich.) *Tribune.*

Reports Iowa Mineral Production in 1930

ROAD BUILDING activity in Iowa during 1930 caused increase in groups of mineral products, James H. Lees, assistant state geologist, reported recently.

Increases were recorded for cement, sand and gravel and stone and lime. A reduction is shown in production of clay wares, coal and gypsum.

A total reduction in value of mineral production of approximately 6½% or $2,334,587 was reported.

Total value for 1930 was $33,626,421, as compared with $35,961,008 in 1929.

Iowa ranked eighth in the United States in barrels of cement shipped from its six cement plants and ninth in value received, the average price being $1.43 a bbl. of 376 lb.—*Des Moines* (Ia.) *Tribune.*

Beg Your Pardon!

AN ITEM in the December 5 issue of Rock Products stated that the Kirkpatrick Sand and Cement Co., Wetumpka, Ala., foundry sand holdings would be sold at public auction December 21.

This item was based on a legal notice announcing the foreclosure sale of the property of one B. F. Burch under a mortgage held by an insurance company to which the Kirkpatrick Sand and Cement Co., Birmingham, Ala., held certain mineral rights. The sale is to be made subject to all the mineral rights of the Kirkpatrick Sand and Cement Co., and this company is in no way involved.

News of All the Industry

Incorporations

Brookfield Quarry and Towage Co., Astoria, Ore., changed name to Brookfield Co.

Shearman Concrete Pipe Co. of Arkansas, incorporated in Kansas, $10,000.

Sterling Concrete Corp., New York City, $5000. H. W. Feder, 2 Lafayette St., New York City.

Cleveland Slag Co., Youngstown, Ohio, 1000 no par shares. Franklin B. Powers, Hugh W. Manchester and M. S. Wilkison.

Glenns Valley Gravel Co., Inc., Greenwood, Ind., 100 shares at $100 each. John B. Webb, Charles Shannon and Leonard A. Hohlt.

Carolina Kaolin Corp., Spruce Pine, N. C., $10,000. H. D. Marmon, S. K. Mortimer of Pineola, and G. R. Ricker of Spruce Pine.

Congers Concrete Products Co., Nyack, N. Y., 200 shares common. N. F. Cough, Nyack. To produce building materials.

Metropolitan Cement Corp., Newark, N. J., $500,000 preferred stock and 400,000 shares common. To manufacture and deal in brick, cement products, etc.

Ontario Sand and Gravel Co., Geneva, N. Y., increased capital stock from 3500 to 7000 shares, consisting of 4000 preferred at $25 each and 3000 common of no par value.

Brocks and Stewart, Inc., 53 W. Jackson Blvd., Chicago, Ill., 4000 shares of no par value. Chason W. Brooks, Charles Stewart and John W. Morsback. To deal in all kinds of building and construction materials.

Sullivan Lumber and Fuel Co., Sullivan, Wis., 100 shares preferred stock at $100 each and 150 shares common stock at $100 each. L. Buelow, O. Zahn and C. R. Krause. To deal in lumber, stone and building materials.

Metropolitan Cement Corp., Newark, N. J., $500,000 preferred stock and 400,000 shares common no par stock. Henry A. Siebrecht, New Rochelle, N. Y., Thomas Graham and Thomas C. Meadows, New York City.

Banks Lime and Mineral Products Co., Boise, Idaho, $50,000. A. R. Masters, Boise, president and general manager, and John Marchetti, superintendent. To produce agricultural lime, poultry grits and other lime products.

H. M. Spahr Lime and Stone Products Co., Spahr, Md., 1000 shares preferred stock, par value $100 each, and 1000 shares common of no par value. Harry M. Spahr, Edward D. Shriner, Jr., and Albert S. Brown. To produce stone and building materials.

Quarries

United Granite Co., Elberton, Ga., has begun operations there. The firm is composed of R. B. Scroggie, C. M. Mattox and L. H. Childs.

Fred Schmidtke, Reedsburg, Wis., has placed crushing machinery in the limestone quarry at Washington and is ready to deliver fertilizer to farmers in the vicinity.

H. B. Richardson and W. E. Stevens, Wenatchee, Wash., have shipped their fourth car of limestone from their deposits in the Wannacut lake district.

Mrs. Anna Wilds Strumquest and others of Albuquerque, N. Mex., have made application of patent to 69 acres of government land near Tijeras. It is claimed that stone deposits in this property are suitable for building purposes.

Minneapolis, Minn. Petition to dissolve the Kettle River Co. of Sandstone, Minn., stone quarry operations was filed in district court December 1. Hearings on the petition have been set for December 28.

Calcite, Colo. The limestone quarries formerly operated here by the Colorado Fuel and Iron Co. have been abandoned and the Interstate Commerce Commission has authorized the Denver and Rio Grande Western Railroad to abandon its line from Howard to Calcite.

Charles W. Fullgraf of St. Louis, Mo., has bought the rock quarry near Oakwood from the F. T. O'Dell Construction Co. Mr. Fullgraf has taken possession of the quarry and expects to make further improvements. It is said he will operate the plant, shipping rock to various parts of the state.

Nicholasville, Ky. A committee composed of County Road Superintendent Woodward and Judge Guyn has been appointed to make contracts with crusher owners in this county to crush rock for the roads according to the specifications furnished them during the winter. All labor except crusher mechanics to be furnished on order of county officials from among those applying to the county for aid.

Sand and Gravel

C. C. Beam, owner of the Beam Stone Quarries, Melvin, Ohio, purchased a gravel pit near Clarksville recently.

Edwin E. Meyers, who owns a sand and gravel plant on Dry Creek near Chico, Calif., suffered damage from fire December 2. Operation of the plant was to have been resumed shortly.

Gallipolis, Ohio. Thousands of tons of gravel for road building are being brought here by barge from New Martinsville, near Wheeling, W. Va., where it is being dredged from the Ohio river.

Construction Materials Corp., Chicago, Ill., has ended its gravel operations for this season and the last loads of gravel have been brought down from Bass River, Mich.

Robert Armstrong, Madison, Wis., has received a contract from city to supply sand and gravel in the city's project to aid in the relief of the unemployed.

Columbia Sand and Gravel Co., Middletown, Ohio, has had G. R. Tom Snider appointed receiver. Previously Gordon Reed and Luther Robinson had been named in this connection.

Midland Gravel Co., Remus, Mich., has sold its gravel plant to W. H. Allswede of Hersey. Buildings are being razed and machinery taken to Grand Rapids. The plant has been shut down for four years.

Fergus Falls, Minn. Purchase of an old gravel pit owned by John Lauritzen has been recommended by the city street committee. It is estimated that 10,000 cu. yd. of gravel will thus be available.

Northwestern Gravel Co., Sac City, Ia., is ruled to have held a valid contract with the Fisher Supply Co. and that it had been fair and frank with its creditors and that there is no proof of any fraud having been committed. This was the decision of Judge Klinker in the case of Fisher Supply Co. against Northwestern Gravel Co.

Galesburg, Ill. A gravel pit has been located on the R. D. Wolf farm near here and indications are that there is a large deposit. Tony Tomlianovich, general manager of the Buckheart Coal and Gravel Co., is in charge of the pit and it is believed this deposit will make possible a large amount of road gravel projects in this community next year.

Cement

Northwestern States Portland Cement Co., Mason City, Iowa, was guest of the local Y. M. C. A. one evening recently. The entire facilities of the Y were at the disposal of the company.

Superior Portland Cement, Inc., Seattle, Wash., has been awarded contract for approximately 40,000 bbl. of cement for use by the United States Reclamation Service.

Rapid City, S. D. The state cement plant will continue to operate indefinitely according to William Fowden. No plans have been made for the annual shut down.

North American Cement Corp., Albany, N. Y., has filed suit asking receivership of National Building Supply Co. The petition recited that the cement company held $16,641 of unpaid notes of the supply company.

Cement Products

Lombardy Lumber Yards, Orange, N. J., lost its concrete block plant in a fire December 5. The entire building and machinery were destroyed.

Mrs. Jean Prince O'Callaghan, principal owner of the Interlocking Concrete Pipe Co., Seattle, Wash., recently had her name changed to Jean Prince for business reasons, it is stated.

American Concrete Pipe Co., South Gate, Calif., has started erection of an addition to its plant which will be used in the production of reinforced concrete pipe.

Spencer, Iowa. The increase in business after the fire here the past summer, has brought a new concrete products firm to the city. The Marlow Co. have established offices and a plant here. J. H. Williams is foreman. Spencer Cement Block Works which has been in Spencer for 20 years is still very active.

Miscellaneous Rock Products

Reliance Rock Asphalt Co., Fort Scott, Kans., has practically completed its new plant there.

Philadelphia Quartz Co., Philadelphia, Penn., has an abridged list of technical articles published during the year in the December issue of its magazine *Silicate P's and Q's.*

Thomaston, Ga. Richard W. Smith, assistant state geologist of Atlanta is in Upson county investigating the supply of mica and feldspar there. This county has large deposits of mica.

C. J. Keller Co., Spruce Pine, N. C., has been formed and is reported to be successfully operating a mica mine just west of Spruce Pine. The company is composed of C. J. Keller, Howard Harmon, E. C. Guy and S. K. Mortimer.

Corona Products Co., Rogers, Ark., manufacturer of silica products, has resumed operations after a shut down of nearly six months, O. F. Mayfield has announced. Due to business conditions in the oil industry this silica market has been somewhat demoralized.

Deer Lodge, Mont. Phosphate is the name of a new official stop for Milwaukee trains according to Superintendent L. K. Sorenson. It was formerly known as Big Bend. Phosphate in huge quantities is produced in the hills near by and trucked for loading by the Wm. Anderson Phosphate Mining Company.

Northwest Magnesite Co., Chewelah, Wash., has resumed operation of its plant there, according to J. C. Hutchinson, manager. Sufficient work is now on hand to assure operation for at least four months, Mr. Hutchinson stated. An intensive sales organization is being promoted for "Thermax," a building insulation board this company manufactures.

Personals

Robert Allgeier is associated with two Spokane, Wash., men in marketing magnesite products in Deer Park, Wash., and vicinity.

Clyde Calvin, Youngstown, Ohio, for many years employed by the Bessemer Limestone and Cement Co., is a candidate for county treasurer on the Republican ticket.

Ira G. Ross, of the United States Gypsum Co., Chicago, Ill., was one of the principal speakers at a meeting of the Acoustical Society of America held in Cleveland recently. He spoke on "The Weighing of Sound Insulation Data Against Frequency."

John Anderson, assistant to J. G. Barry, vice-president of the General Electric Co., Schenectady, N. Y., has been appointed secretary of the sales committee of the General Electric Co. Mr. Anderson succeeds E. G. Waters who is retiring at his own request on the completion of more than 42 years continuous service. Mr. Anderson graduated from Guilford College, N. C., and in 1910 received a degree of Electrical Engineer from Lehigh University. He joined General Electric in that year and has been in its service since.

Obituaries

George R. Huntley, 48, president of the Cement Products Supply Co., Toledo, Ohio, died December 5 in St. Vincent's hospital.

James A. Young, Twin Falls, Ida., owner of the Home Gravel Co., died suddenly at his home, November 18.

William M. Rex, 62, manager for the Ingelside Limestone Co., died from injuries received when he was run over by a loaded car at the quarry dump near Wheatland, Wyo.

T. J. Meldrim, 54, Jefferson, Ga., who organized the Southeast Granite Co. of Atlanta, died while returning from a busines trip to New Orleans, November 28.

Haye K. Hill, 49, Columbus, Ohio, salesman for the Columbus Coal and Lime Co. and formerly vice-president of the Columbus Builders' Supply Co., died of pneumonia at his home, December 9.

James Ross Mayer, Erie, Penn., who organized the Silver Creek Sand and Gravel Co. of Silver Creek, N. Y., and the Nickle Plate Sand and Gravel Co. of Erie, Penn., died at his home in Erie, December 5.

Donald Fraser, 78, director and former vice-president of Chain Belt Co., Milwaukee, Wis., died on November 20. Mr. Fraser joined the Chain Belt Co. in 1885 and was very active in the early developments of the company.

John G. Matt, 72, Kansas City, Mo., died November 20 in Pampa, Tex. Mr. Matt operated the quarry which furnished stone for the Chicago and Alton Railroad bridge and other construction projects in Kansas City. He has also spent many years in the contracting business.

Manufacturers

Chain Belt Co., Milwaukee, Wis., announces it has appointed the Ohio Valley Machinery Co. of Marietta, Ohio, as its distributor in eastern Ohio.

Masonite Corp., Chicago, Ill., announces it has signed for space in the Housing exhibit of "A Century of Progress" exposition to be held in Chicago in 1933.

Foster D. Snell, Inc., Brooklyn, N. Y., announces the appointment of Harry J. Hosking to its research staff and W. C. Pinkerton as industrial representative.

American Brake Shoe and Foundry Co., New York, N. Y., is featuring its "Brakeblok" in general advertising. This product is said to be an improved type of automatic brake lining.

Kohler Co., Kohler, Wis., will feature a special cutaway model showing the construction and operation of Kohler electric plants at its exhibit at the 29th annual Road Show.

Lincoln Electric Co., Cleveland, Ohio, announces that its new New York office address is the McGraw-Hill Bldg., 330 W. 42nd St. G. N. Bull continues as district manager.

Ajax Flexible Coupling Co., Westfield, N. Y., anounces it recently received an order for over 800 flexible couplings to be used on the conveyor drives to be installed in the new Chicago postoffice.

Young Radiator Co., Racine, Wis., announces it will have an exhibit at the Road Show in Detroit. A number of its newer products of interest to the users of heat transfer apparatus will be shown.

Perfex Corp., Milwaukee, Wis., announces it will exhibit at the Road Show to be held in Detroit. A special feature of this year's exhibit will be the showing of the new Perfex cellular core in addition to its old line of tubular type radiator cores.

Automatic Screw Machine Products Co., Chicago, Ill., has been licensed by the Dardelet Threadlock Corp. of New York to manufacture nuts and machine parts threaded with the Dardelet self-locking screw thread.

Trade Literature

NOTICE—Any publication mentioned under this heading will be sent free unless otherwise noted, to readers, on request to the firm issuing the publication. When writing for any of the items kindly mention ROCK PRODUCTS.

Materials Handling Pumps. Bulletin gives specifications and details of Amsco type "C" materials handling pumps. AMERICAN MANGANESE STEEL CO., Chicago Heights, Ill.

Automatic Control Instruments. Folder tells of many applications of automatic control equipment in various production operations. BROWN INSTRUMENT CO., Philadelphia, Penn.

Cranes. *Crane Service News* illustrates many types of work on which the Crane Service Association furnished equipment. CRANE SERVICE ASSOCIATION, Lorain, Ohio.

Hoisting and Conveying Equipment. Catalog 15 gives information on hand-operated chain hoists, trolleys, hoists, traveling cranes, jib cranes and electric hoists. WRIGHT MANUFACTURING CO., Bridgeport, Conn.

Dust Recovery Equipment. Bulletin 45 describes installation of dust recovering equipment in an industrial plant. DUST RECOVERING AND CONVEYING CO., Cleveland, Ohio.

Conical Scrubber and Grinding Equipment. Bulletin describes use of "Hardinge" conical scrubbers for washing sand and stone and tells of economy of "Hardinge" ball mills. HARDINGE CO., INC., York, Penn.

Potentiometer Pyrometer. "Our Work Hinges on Heat" is the name of illustrated booklet describing details of construction of the Brown potentiometer pyrometer. BROWN INSTRUMENT CO., Philadelphia, Penn.

Continuous Blow-Down System. Bulletin describes the method of reducing blow-down losses, minimizing concentration, protecting boiler surfaces and other information pertaining to this subject. ELGIN SOFTENER CORP., Elgin, Ill.

Wire Rope. Broadside illustrates various projects where Roebling wire rope has been used. The Hudson river bridge features this publication. JOHN A. ROEBLING'S SONS CO., Trenton, N. J.

Industrial Railways. Bulletin 102 describes many details of the construction of a.c.f. industrial cars and railway equipment. Essential data for complete installation is given. AMERICAN CAR AND FOUNDRY CO., New York, N. Y.

Drag Scrapers. October issue of *Sauerman News* tells of method in which its drag scraper increases crane's working range. Also describes junior cableway as used by David Johnson at Cecil, Ohio. SAUERMAN BROTHERS, INC., Chicago, Ill.

Power Pumps. Specification sheet D-412-S6 describes type D-2437 horizontal duplex piston pattern pumps, giving capacities, sizes and description. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

Wire Rope. October issue of *Yellow Strand* features the use of B & B ropes at work in the 58-year-old quarry of the Illinois Electric Limestone Co. A detailed description of the production operations is given. BRODERICK AND BASCOM ROPE CO., St. Louis, Mo.

Air Separators. Bulletin describes performance of air separators in hydrated lime, dry colors, cement and miscellaneous applications. Features of the Whizzer's principle of operations are described. RAYMOND BROS. IMPACT PULVERIZER CO., Chicago, Ill.

Spray Gun. Catalog sheet T-2, Form 179, describes Binks new "Thor" model 2 spray gun. The nozzle construction is illustrated and described together with feature which does away with adjustable nozzle. BINKS MANUFACTURING CO., Chicago, Ill.

Crushers. Catalog 14-B gives specifications and details of stone crushers and quarry equipment, including sand and gravel washing plants, lime crushing and pulverizing plants, portable crushers and related equipment. ACME ROAD MACHINERY CO., Frankfort, N. Y.

Manganese Steel Screens. Bulletin 230, Economy of Rol-Man Screens, gives detailed information on methods of application to various types of revolving equipment. Table of sizes of screens is given and installation details illustrated. MANGANESE STEEL FORGE CO., Philadelphia, Penn.

Single Phase Motors. Leaflet 20516 announces a new single phase motor suitable for use on pumps, compressors, ventilating fans and other applications where high starting torques are necessary. WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., East Pittsburgh, Penn.

Power Shovels. September-October issue of *The Groundhog* illustrates many uses of Marion shovels and description of Wabash Cement Co. quarry operations is given. Announcement of prizes to contributors of suitable pictures for illustrations in the magazine is also made. MARION STEAM SHOVEL CO., Marion, Ohio.

X-Ray Examination of Welded Pressure Vessel Seams. Pamphlet discusses the X-ray method of testing prescribed in the A. S. M. E. Code and an installation of X-ray equipment representative of the latest development in this field is described. COMBUSTION ENGINEERING CORP., New York, N. Y.

Drying Machinery. General catalog illustrates installations and describes applications of various types of drying equipment. A complete description of the Louisville "Type L" rotary dryer, with illustrations, is included. Continuous filters, screens and inner tube suspensions are also described. LOUISVILLE DRYING MACHINERY CO., Louisville, Ky.

Modern Steam. Bulletin outlines the evolution of marine steam propulsion from low pressure plants to present use of modern steam. Also deals with economies of steam propulsion from the standpoint of fuel consumption, cost of fuel, lubricating oil costs, flexibility of operation and other important factors. BABCOCK AND WILCOX CO., New York, N. Y.

Specifications for steam-air ejector; specification sheet W-205-S1A describes two-stage condensing combined surface intercooler and aftercooler type—double unit. **Specification sheet W-205-S2** describes two-stage condensing combined surface intercooler and aftercooler—single unit. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

Classification of Steels for Steel Castings. The first of a series of pamphlets contains technical information on carbon steels of varied content, low alloy steels of manganese nickel and manganese molybdenum, alloy steels of nickel chromium and chrome vanadium, and alloy steels of chrome molybdenum. Physical property ranges and suitable applications of each type are given. DETROIT STEEL CASTING CO., Detroit, Mich.

Furnace Linings and Arches. Bulletin describes boiler furnace linings, walls and arches made of "Steel Mixture" refractories and many different arrangements of settings for water tube and horizontal return tubular boilers. Flat suspended arches for water tube boilers and many types of furnace walls are illustrated and described in this bulletin. Other "Steel Mixture" products are also described. McLEOD AND HENRY CO., Troy, N. Y.

Motors. GEA-475 describes type SCR single phase vertical motors of ½ to 10 hp., 60 cycle current. Specifications of different sizes are given. **GEA-1483** describes medium-speed alternating-current generators for belt drive or direct connection, types ATB and ATI. Construction details are shown. **GEA-560B** illustrates type SCR constant-speed, single-phase motors, describing applications and illustrating construction features. **GEA-246C** describes "7500 series" general-purpose synchronous motors, types TS and QS. Details of construction are illustrated. GENERAL ELECTRIC CO., Schenectady, N. Y.

Property Owners Pay Half of Cost of Gravel Streets

HENRY BASLEE is the successful bidder for hauling the gravel that will be used for Green Ridge, Mo., street improvements.

The property owners raised half of the funds needed for this work and the city pays the other half, the custom that has been followed for all the graveled streets in Green Ridge.—*Green Ridge* (Mo.) *News.*

City Builds Concrete Pipe Plant for Unemployment Relief

A PLANT for manufacture of concrete pipe has been installed by the public works department of the city of Englewood, N. J., as part of the effort to meet the local unemployment situation. Six men are employed on this work and the pipe will be installed in the drainage system of the city as a feature of the unemployment relief program during the coming winter months.—*Hackensack* (N. J.) *Evening Record.*

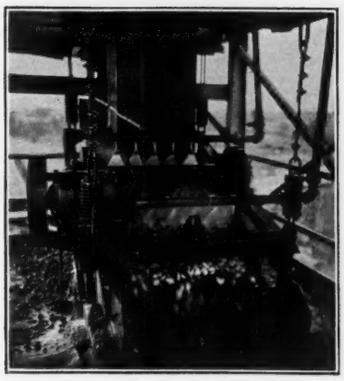
Organize Materials Handling Institute

AT A MEETING held in Cleveland, Ohio, December 8 and attended by over 70 representatives of materials handling equipment manufacturers, an organization to be known as Materials Handling Institute was formed, the object of the association being primarily educational to promote a more intense mechanical handling consciousness in the minds of industrial executives, also to promote better understanding of the relationship in a cooperative way between the various groups.

The following officers were chosen: F. E. Moore, Mathews Conveyor Co., president; J. B. Webb, J. B. Webb Co., vice-president; H. W. Standert, Northern Engineering Works, treasurer, and J. A. Cronin, Materials Handling and Distribution, secretary.

A board of governors was elected, and this group of governors was given authority to add to their number as they see fit after making a study of the industry groups in more detail. The board of governors and officers were given power to choose various committees, including constitutional and by-laws committee, publicity, educational, etc.

Complete Washing Equipment *for* Producing Clean Aggregate



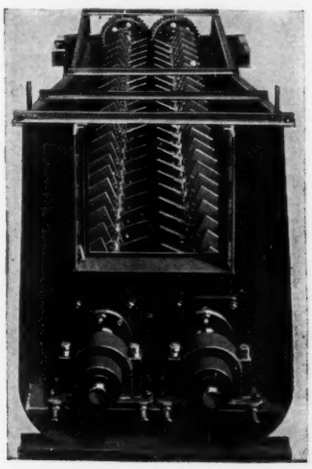
Vibrating Screen with Sprays for Washing.

THE demand for clean washed aggregates is increasing rapidly and concrete specifications are becoming so stringent that this phase of the producing problem has become vitally important.

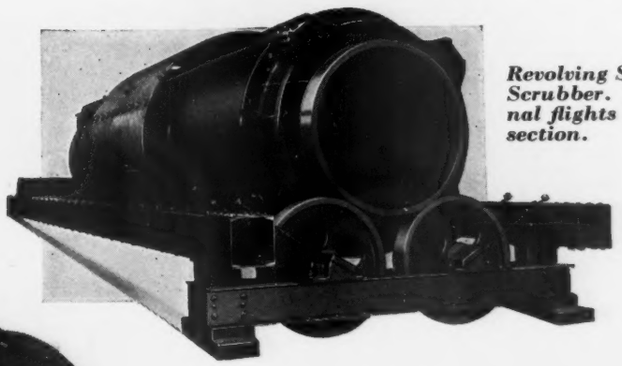
Because some materials are easy to wash whereas others are difficult, depending upon the nature of the deposit, the selection of proper combinations of machinery to meet these varying conditions necessitates a complete line of washing equipment.

Allis-Chalmers has supplied machinery for many washing plants, having a wide range of machinery to meet every condition and engineers with experience in applying this machinery.

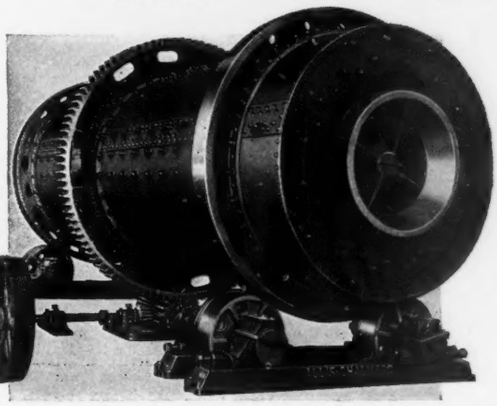
A new booklet has been prepared on this important subject. Write for Bulletin 1471.



Log Washer for Stone or Gravel.

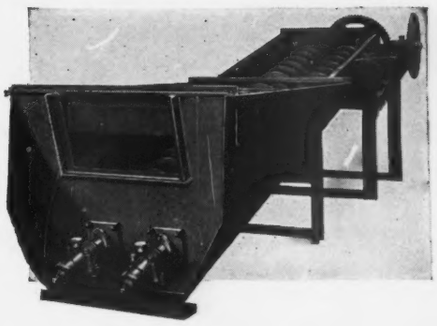


Revolving Screen Type Scrubber. Note internal flights in washing section.



Left - Stone Scrubber.

Right - Double Screw Sand Washer.



ALLIS-CHALMERS

Allis-Chalmers Manufacturing Company, Milwaukee

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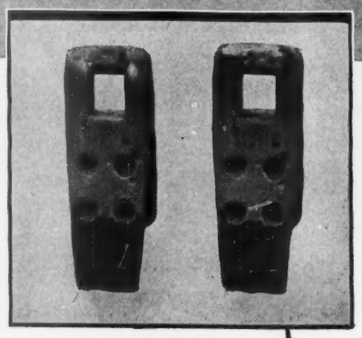
This large operator restores dipper fronts with TIMANG. Photos show worn down and cracked digging and lower edges before and after welding.

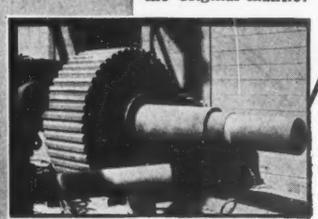


Latch plates, as well as dipper teeth, are kept in service at this plant by building-up with TIMANG Manganese steel welding rod. Photo shows latch plates before and after welding.

Several blades in this cast steel runner were broken, others badly worn. They were quickly welded and built-up with TIMANG and the runner restored to service.

TIMANG Cuts Costs Wherever Wearing Parts Are Used

Restoring gyratory mantle by building-up with TIMANG. In this plant, the built-up mantle gives the same service as the original mantle.



The flutes of these corrugated roll shells are kept "built-up" with TIMANG. The welding is done right in the crusher at night — without dismantling, or interrupting operations.

Tisco TIMANG

(AIR TOUGHENING)

Steel Welding Rod

WELDS made with TIMANG possess the same hardness — the same resistance to wear — as cast (12%) Manganese steel. Moreover, the TIMANG weld is ductile, and will not crack in service. • Thus any wearing part which is welded or built-up with TIMANG, will give the same or even better service than the original part. *TIMANG doubles the life of wearing parts, at half the cost.* Actual service records from mines, crushed stone plants — wherever wearing parts are used — bear out this statement. • If you are using Manganese steel in any form, or carbon steel parts which can be made more serviceable by coating with a layer of long-wearing Manganese steel, investigate TIMANG today. Send for bulletin.

TAYLOR-WHARTON IRON AND STEEL CO.

HIGH BRIDGE, NEW JERSEY

SALES OFFICES: Chicago Los Angeles New York Pittsburgh Scranton Boston Houston Montreal Philadelphia San Francisco Tampa

"TIMANG" Trade Mark is registered in United States and foreign countries. "TIMANG" Steel is protected by U. S. Patent 1,732,272 and foreign patents. Other patents pending.

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Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

Chicago, December 19, 1931 | Issued Every Other Week | Volume XXXIV, No. 26

Xmas and New Year's!

At Christmas play, and make
good cheer,
For Christmas comes but once
a year.

—*Thomas Tusser,*
who lived 1523-1580

THE staff of Rock Products extends to its readers, advertisers, friends, its heartiest and most sincere wishes for a Merry Xmas and a Happy New Year.

CONVENTIONAL words of greeting for this season of the year! But this message is penned with deep-felt gratitude and appreciation of all these relations and contacts have meant to us during the years that together we have seen our industry grow and prosper.

TO be sure, we have also seen an interruption to its growth and prosperity—along with similar interruptions to all industrial progress in this country and elsewhere. But the year 1931 is almost over. We are confident the worst that fortune has in store for us is over too.

AN unknown future lies before us. The holiday week is our opportunity, definitely and finally, to put out of mind our business and economic worries and troubles; to strengthen our minds and hearts from the only source of spiritual and moral strength the Universe knows.

WE can and will enter the New Year with an awakening of latent American courage and enthusiasm. We will concentrate on constructive measures of economic recovery, now clearly defined, if not yet fully understood.

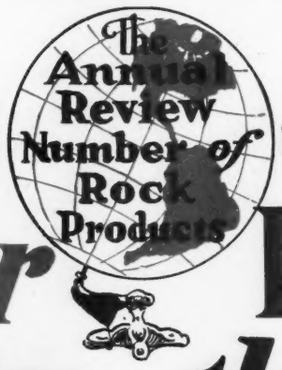
THE power of the human mind in the aggregate controls the destiny of the human race and all human relations.

MANY minds working in the dark at cross-purposes for short-sighted goals are responsible for our past troubles. Many minds working in the light for a common goal can accomplish miracles.

WE confidently believe we shall soon witness such a miracle. With a country of unmeasured wealth and limitless resources in materials, power, brains, energy, enthusiasm, ambition, we will live to look back on the dark pages of 1929-1931 as an unbelievable lapse of our customary sanity.

—The Staff of ROCK PRODUCTS

Member of A. B. C. (Audit Bureau of Circulations) and of A. B. P. (Associated Business Papers). The Oldest Publication and Recognized Authority in This Industry. Net Printing of This Issue Exceeds 6,000 Copies.



Put *Your* Product *On the Map*

BY placing *your* advertisement in the January 9, 1932, ANNUAL REVIEW NUMBER of ROCK PRODUCTS you cover the *non-metallic* industries—the Producers of Cement, Lime, Gypsum, Crushed Stone, Sand and Gravel, etc.

Your advertisement in this unusual institutional annual issue not only reaches thousands of readers—all of whom are buying executives—but it reaches them time and again during 1932.

This issue—the largest of any in the rock products industry—is well nigh an ideal combination of production, operation and merchandising information, and catalog of equipment and machinery for the industry.

It is *your* opportunity to reach *your* prospects with *your* message. You can do this at reasonable cost through ROCK PRODUCTS. You are allying yourself with the outstanding contact medium between manufacturer and consumer, when you address your prospects through ROCK PRODUCTS.

Here are a few facts on why your advertising is effective through ROCK PRODUCTS:

ROCK PRODUCTS	is first in bona fide paid producer executive subscriptions.
ROCK PRODUCTS	is first in number of important plants reached by paid subscriptions.
ROCK PRODUCTS	is first in number and percentage of mail subscriptions renewed.
ROCK PRODUCTS	is first in volume of advertising.
ROCK PRODUCTS	is first in amount of advertising placed by advertising agencies.
ROCK PRODUCTS	is first in amount of editorial space.
ROCK PRODUCTS	is first in number and amount of original editorial articles.
ROCK PRODUCTS	is unquestionably the leader in the field!

From 150 to 227 manufacturers of materials and equipment have used ROCK PRODUCTS ANNUAL REVIEW issues each year (1927-1931). Can you afford to be among the few of those missing?

Plan at once to use dominant space in this issue for your sales message

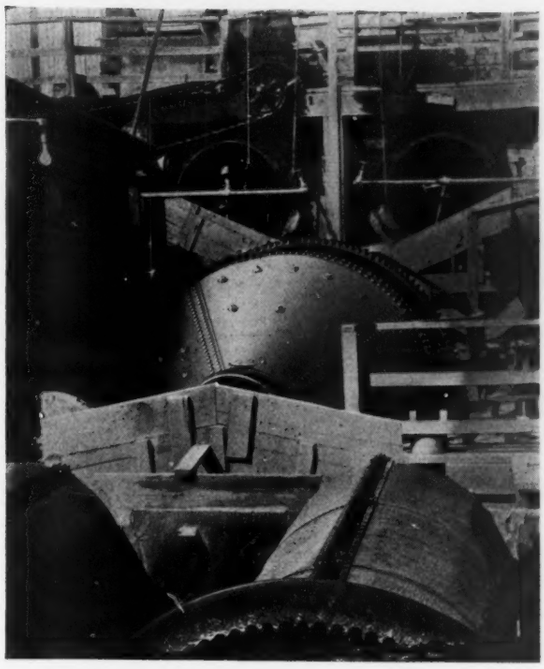
MEMBER AUDIT BUREAU OF CIRCULATIONS

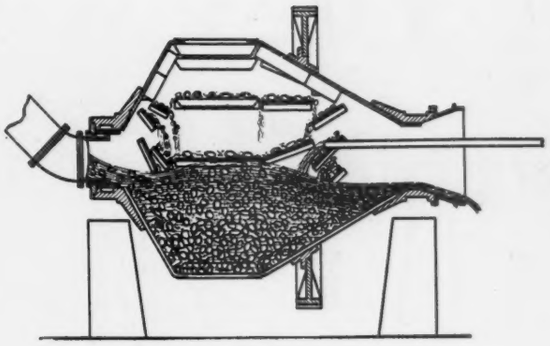
Rock Products

With which is Incorporated CEMENT and ENGINEERING NEWS Founded 1896

ABP

542 South Dearborn Street, Chicago, U.S.A.





Scrubbing Stone With the Hardinge Conical Washer

The above illustration shows one of the Scrubbers installed by a Southern Company to wash its phosphate pebble. Two Scrubbers are used in the complete circuit, producing phosphate pebble at the rate of 60 tons an hour from a feed containing sand and large amounts of hard clay balls.

The Conical Scrubber cleans stone by mass contact. One piece rubs against another under water and under pressure of the material above. The clay is literally scoured off the face of the stone, and the clay balls are mashed and quickly disintegrated.

This is a relatively new idea in scrubbing, but the principle is sound. It must be since the Hardinge Conical Scrubber is a proved success in the most difficult of all fields—that of removing hard clay balls from a relatively soft phosphate pebble without disintegrating the pebble.

Units are built to handle capacities from 10 tons to over 1,000 tons per hour. Wash water requirements are unusually low, and repairs are nil, since the same general design is used as that for the Conical Ball Mill, which must withstand many times the abuse that is subject to a Scrubber of stone, gravel or sand.

Write for Information

HARDINGE COMPANY
Incorporated
York, Penna.—Main Office and Works
New York — 122 East 42nd Street
Chicago — 205 West Wacker Drive
San Francisco—235 Montgomery St.

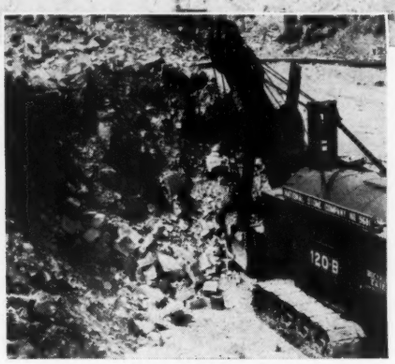
Hardinge

Conical Ball, Pebble and Rod Mills, Ruggles-Coles Dryers, Feeders, Rotary Conveyors, Stone Screens, Thickeners and Clarifiers

When writing advertisers, please mention ROCK PRODUCTS

They were *good old shovels*

but the boss had no sentiment when he saw the cost figures



The modern shovel that took their place — a Bucyrus-Erie 4-yard

The boys in the pit had worked with these two railroad shovels for many years. The boss knew that they had made lots of money in days gone by—and they were still in pretty good condition.

But the cost figures couldn't stand up against those of a modern Bucyrus-Erie, full revolving electric quarry shovel. The old shovels were set out on the bank—the new one dug in.

For three years the modern machine has carried the quarry's full production load at a lower cost per ton.

A modern Bucyrus-Erie takes wider cuts—reduces track moving costs—works farther back from the face, with less danger from slides—has great mobility—avoids delays for secondary blasting—digs more rock per machine, at lower over-all operating cost.

Let us help *you* do some cost figuring.

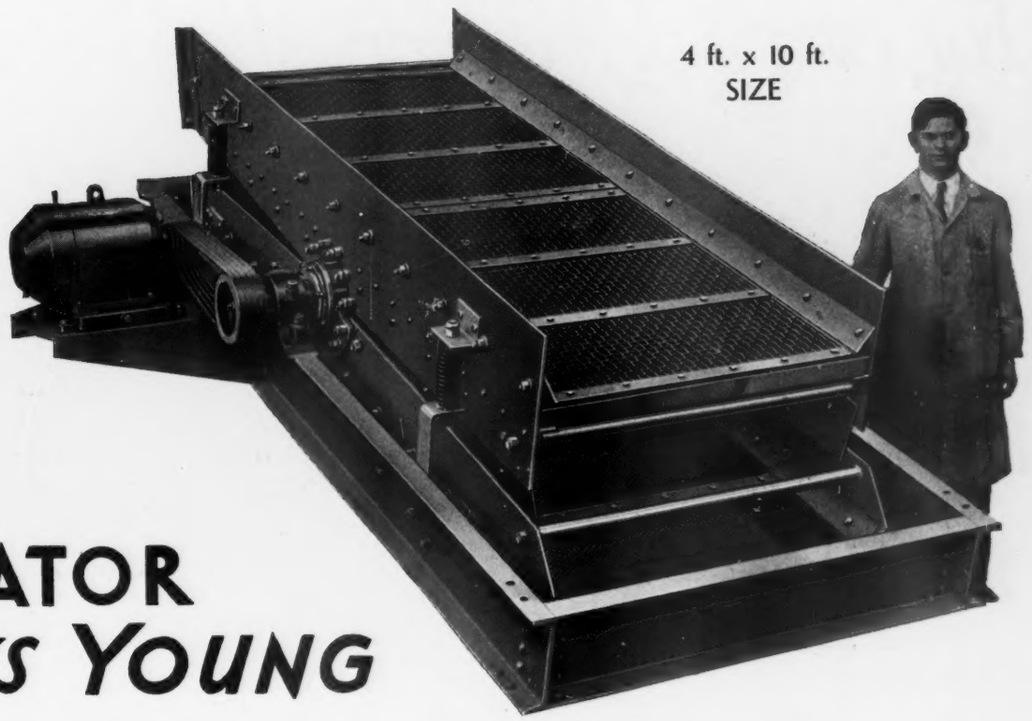
1½, 2, 2¼, 2½, 3, 4 and 5-yard to choose from.

A-402

BUCYRUS ERIE

BUCYRUS-ERIE COMPANY, South Milwaukee, Wis.

Representatives throughout the U.S.A. *Branch Offices:* Boston, New York, Philadelphia, Atlanta, Birmingham, Pittsburgh, Buffalo, Detroit, Chicago, St. Louis, Kansas City, Mo., Dallas, San Francisco. Offices and distributors throughout the world



This VIBRATOR STAYS YOUNG

Most vibrators are peppy enough when they're new, but hard work ages them rapidly. Not Telsmith! It does its stuff efficiently...without effort. The two decks are vibrated rapidly; but they act in opposite directions. The vibratory movement is so perfectly balanced that the main frame receives practically no vibration. The wire cloth is not in tension...does not split. Bolts and rivets stay tight. Crystallization is averted. The whole outfit stays young. For performance facts, write for Bulletin V-11.

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TELSMITH FEATURES

- Balanced Vibratory Movement
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- Thorough Classification
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- All-Steel Construction
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- Single Deck is Convertible to Double Deck in the Field

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V-7

TELSMITH
Balanced
VIBRATOR

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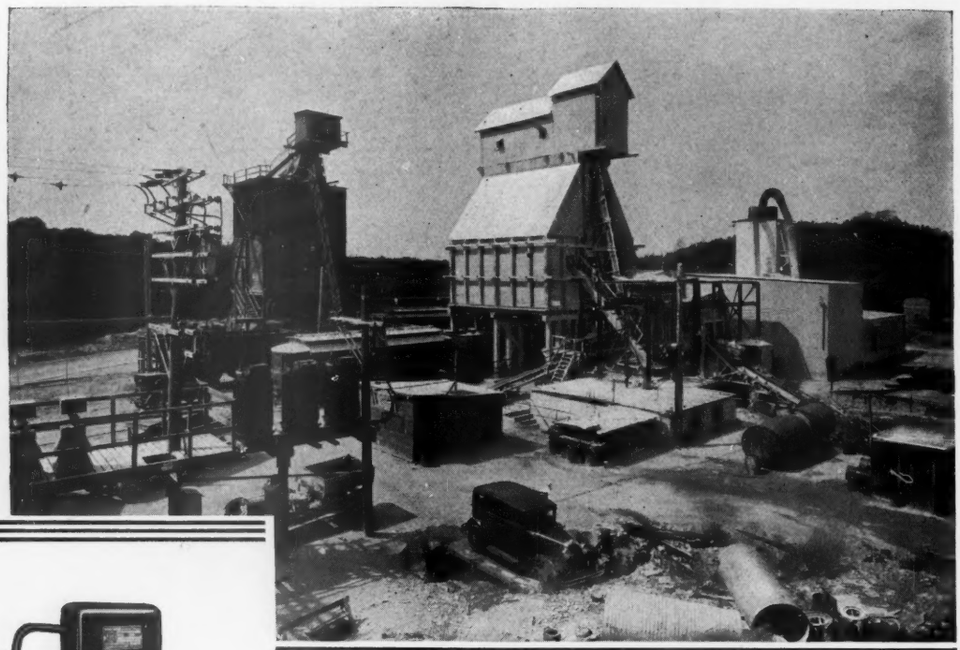
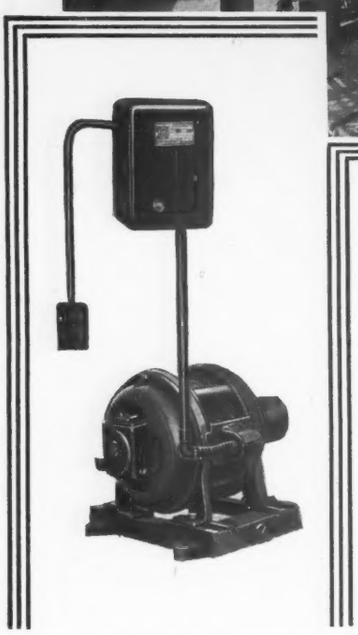
For every drive in crushed-stone plants





Above is illustrated the G-E motorized plants of the Public Service Quarries Co. and the Ready Mixed Concrete Co. of Kansas City, Mo. An interesting feature of the crushed-stone plant is the fact that the rock is mined. Note slope hoist at right.

The Right Motor *and the* Right Control

WHEN you specify G-E Motorized Power, you obtain (1) the right motor for each job, selected from a wide range of sizes and types; (2) the right controller for each motor, available from an extensive line of modern control; (3) field-engineering service to apply the correct combination of motor and control to each job.

After your plant is running, you are safeguarded by adequate warehouse stocks located within quick reach and by efficiently manned service shops to help you in emergencies.

A large percentage of all crushed-stone plants find G-E equipment, engineering, and service so thoroughly satisfactory that they continue, year after year, to intrust General Electric with their every electric requirement.

Complete information will be furnished to you upon request to the G-E Sales Office nearest you.

JOIN THE "G-E CIRCLE"—SUNDAYS AT 5:30 P.M. E.S.T. ON N.B.C. NETWORK OF 54 STATIONS—WEEK-DAYS (EXCEPT SATURDAY) AT NOON

200-445

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SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

EAGLE SAND AND GRAVEL WASHERS

A Model Plant Uses Modern Washing Equipment

The plant of the Des Moines Sand and Fuel Company, Des Moines, Iowa, has aroused a great deal of interest due to its highly efficient design.

Among the units which contribute largely to this plant's efficiency is a battery of four EAGLE Gravel Washers.

These washers completely eliminate all foreign matter taken with the gravel from the artificial lake and deliver a quality material that has given Des Moines Sand Products an enviable reputation in the trade.

Eagle Washers are built in separate types for cleaning sand and gravel. Either type is made with single or double screws from 15" to 24" diameter. There is a size for any capacity requirement, and we can build special Washers where special conditions require. In addition there are machines for dewatering sand and an attachment for shale removal. Investment in this up-to-date equipment pays worth while dividends.

Send for our Eagle Washer bulletin—it contains complete specifications. Our Engineers will gladly help you on washing plant design without obligation.

An EAGLE "Swintek" Ladder also plays no small part in the economical production of Sand and Gravel at the Des Moines Sand and Fuel Company—another reason why this is a model plant.

Make booths 68 and 69 at the Sand & Gravel Convention your headquarters

See our new electrically operated Flume Valve Classifier for sand separation—Also working models of the Eagle "Swintek" Ladder and Double Screw Washer

EAGLE Products Include:

EAGLE Double Roll Crusher | Olson Self-dumping Cages | EAGLE Dry and Wet Pans
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EAGLE IRON WORKS
DES MOINES - IOWA

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SEVEN MILES OF ROTARY KILNS

During the years 1927-30, the Smidth organization sold 139 Rotary Kilns. The total length of these is about ***seven miles,*** and their annual output more than 60,000,000 barrels. Of these, 125 are Unax Kilns with the cooling cylinders mounted on the outlet end of the kiln shell. Among these are several kilns 400 feet long.

Four Unax Kilns, furnished by F. L. Smidth & Co., for a cement plant in North America

Increased fuel economy, improved operation of kiln, effective cooling, better and easier grinding clinker, lower installation cost and other advantages of these modern kilns, account for their enthusiastic reception.

Write for information

F. L. SMIDTH & COMPANY

ENGINEERS

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Designers and Equippers of Cement Making Factories

Kiln Temperature Control *with* BAILEY FEEDERS

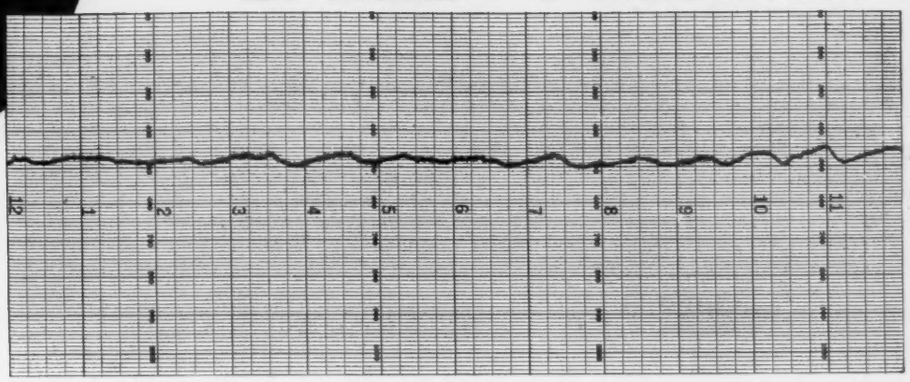
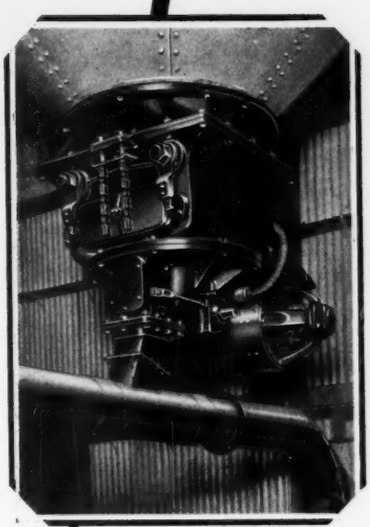


Chart of exit-gas temperature from rotary kiln served by a Bailey Feeder. Note the uniform temperature; evidence of kiln efficiency, uniform burning, and economical operation.



Bailey Pulverized-Coal Feeder in a large cement plant

Can feeding of pulverized coal be controlled? One of the best answers to this important question is shown on the temperature charts of exit-gases from kilns served by Bailey Pulverized-Coal Feeders.

The charts indicate little variation from a uniform temperature. Thus, there is assurance that the clinker was uniformly burned due to the positive, even, controlled feed of uniformly aerated coal supplied by the Bailey Feeder.

These kilns invariably have records of remarkably low fuel consumption. Savings of 5 to 10 lb. of coal per bbl. of clinker are often reported and that is why more and more Bailey Feeders are being installed.

We welcome an opportunity to make a layout of Bailey Feeders for your plant. Address, Fuller Lehigh Company, 85 Liberty Street, New York, N. Y.

FULLER LEHIGH

A BABCOCK & WILCOX ORGANIZATION

246-A

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What has a Bathing Cap

IN recent seasons, women have discovered that their bathing caps continue to keep the hair dry long after old-time caps would have been torn and leaky.

Goodrich Age-rite, a non-oxidizing compound, is responsible. Our research workers who perfected Age-rite found that by adding it to the rubber in the mixing mills, they could double and triple the aging properties of the rubber compound.

From bathing caps, we turned to conveyor belts. Introducing Age-rite, we succeeded in practically eliminating any fear of deterioration from age, either in friction or cover during the normal life of the belting. A quality worth a lot in operations where belts frequently stand idle.

Stubborn resistance to aging is but one characteristic of Goodrich conveyor belting. But the perfecting of Age-rite is typical of the lengths to which Goodrich has gone to give you better belting.

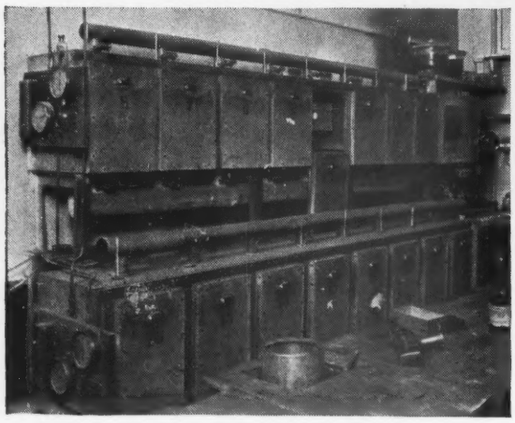
Marked improvements in abrasion resistance, in adhesion, were followed by the development of the Highflex construction, a noteworthy advance in structural design.

As a result, Goodrich belting is more flexible. Hugs drive pulleys more efficiently. Runs straight whether empty or loaded. Troughs perfectly. And its superior flexibility permits perfect contact with idlers.

Note particularly that it is so vulcanized that the edge becomes "riveted" inseparably to the body of the belt. Inasmuch as the edge is the most vulnerable part of a conveyor belt, this improvement contributes in a marked degree to prolonged life.

• • •

Address your requests for literature, for engineering counsel, to The B. F. Goodrich Rubber Company, (Est. 1870), Akron, Ohio. Distributors everywhere.



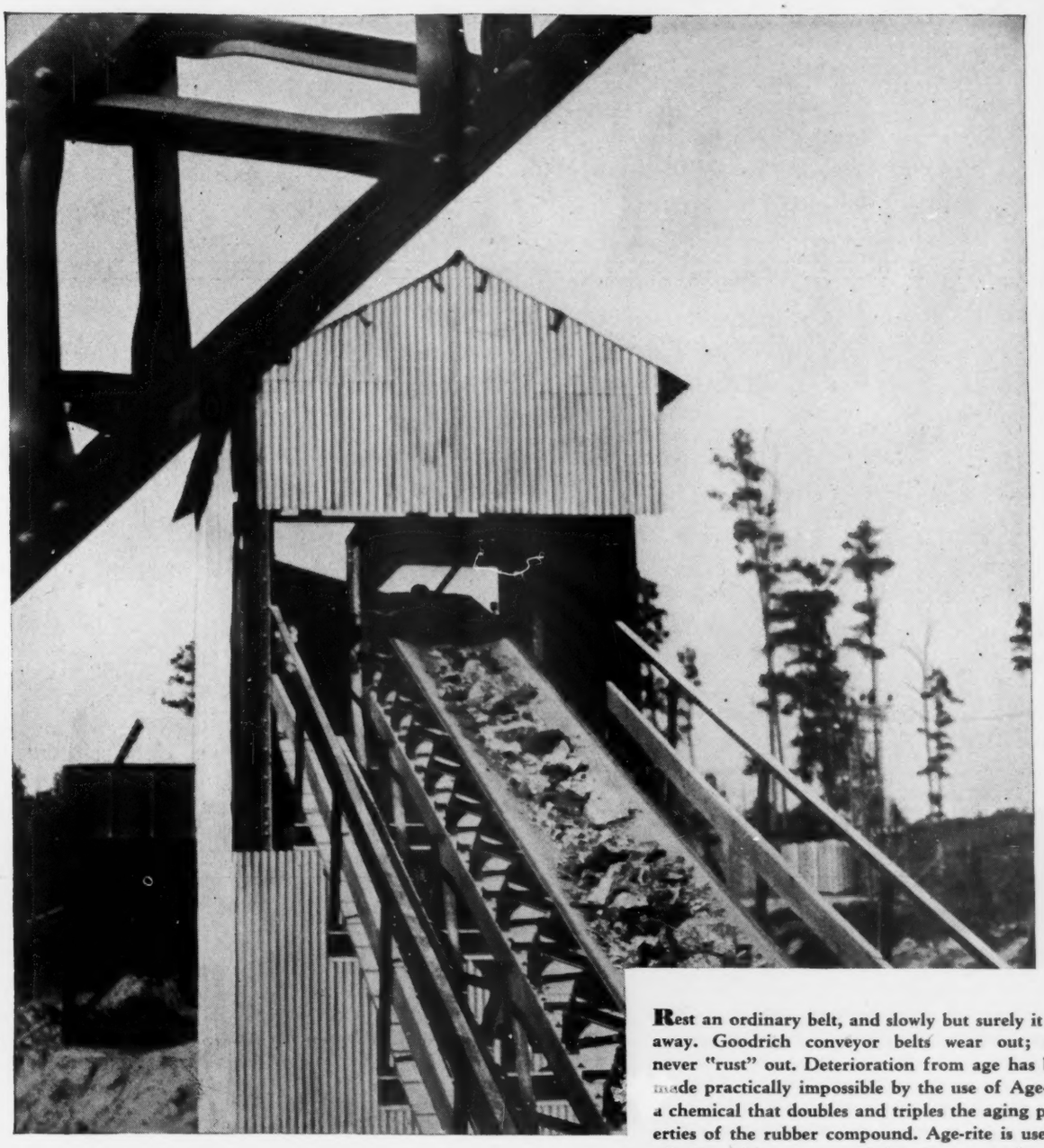
"LIFE-OVENS" in the Goodrich laboratories where samples of conveyor belting are tested for aging. It is estimated that a day in one of these ovens is equivalent to six months of natural aging.

BOTH OF THESE BATHING CAPS had been placed in the Goodrich "life-oven" for a period estimated to be equal to a year or more of natural aging. The one on the left had Age-rite in the rubber. The one on the right did not.

Goodrich

Conveyor, transmission and elevator belting • air, water and suction hose • rubber-lined tanks and tank cars • packing and molded goods.

to do with Belting . . ?



Rest an ordinary belt, and slowly but surely it rots away. Goodrich conveyor belts wear out; they never "rust" out. Deterioration from age has been made practically impossible by the use of Age-rite, a chemical that doubles and triples the aging properties of the rubber compound. Age-rite is used in all Goodrich conveyor belts. Consequently wear comes only when they work.

Conveyor Belting

Another B. F. Goodrich *Product*

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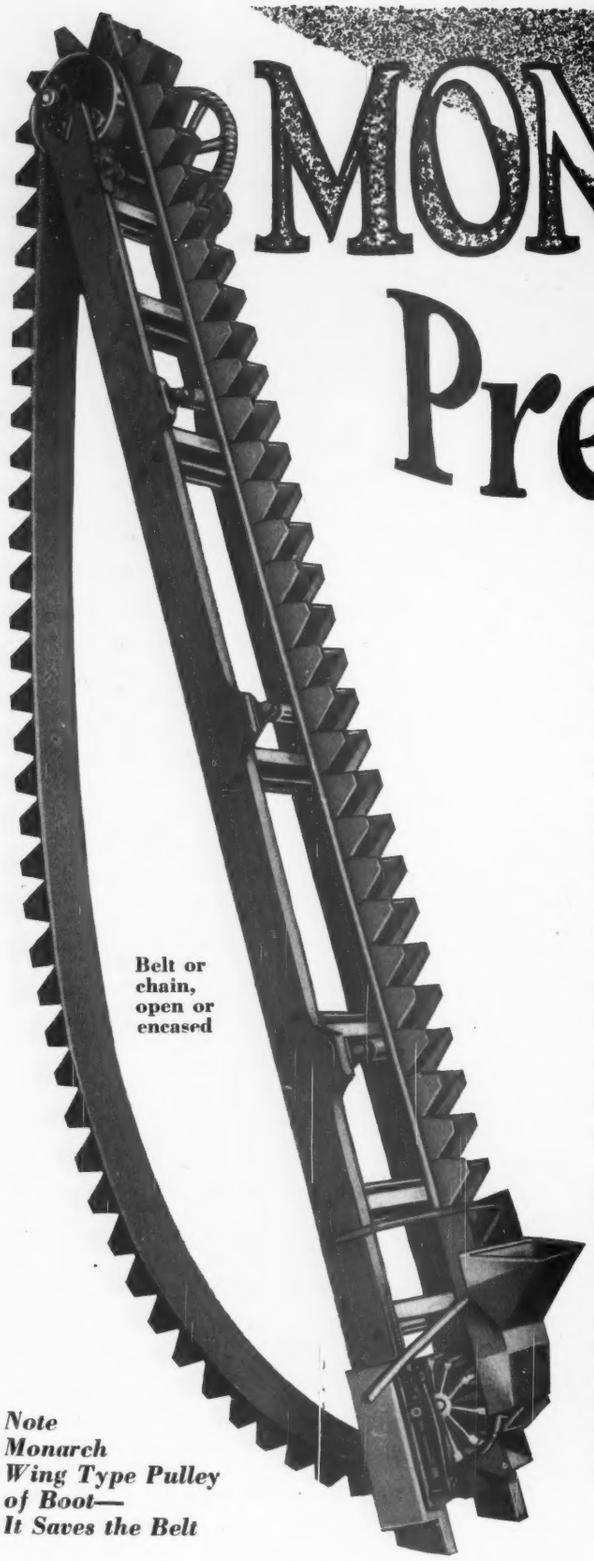

Note Monarch Wing Type Pulley of Boot— It Saves the Belt

MONARCH Bucket Elevators are preferred by those operators who appreciate that any equipment that has passed the experimental stage, has gained in popularity and has been consistently recommended by its users, must be a profitable investment.

Like all Monarch equipment, Monarch bucket elevators are designed to give years of efficient, trouble-proof service, economically.

Careful attention to every detail, the selection of wear-resisting materials and expert assembly, together with a final, rigid inspection by experts, is your assurance that Monarch bucket elevators will give you the same satisfactory service they are giving operators everywhere.

Before deciding to install any material handling equipment, investigate the MONARCH LINE, which includes:—

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Strike out that "extra" operation

Why not DRY your product *as you grind it*—and dispense with separate dryers, elevators, conveyors and other auxiliaries?

That is the modern way—the Kiln Mill way—as now practiced in scores of plants, where many producers are cutting costs as much as 25% to 50%.

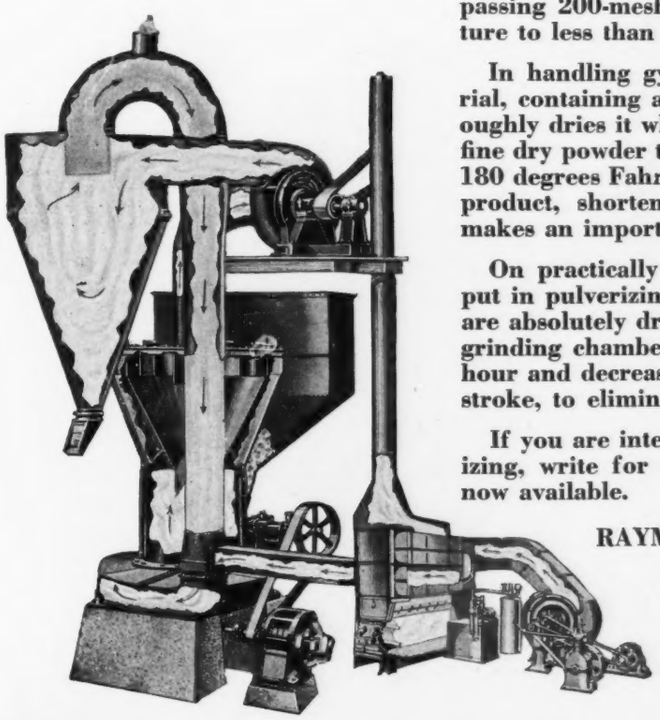
Consider the reduction of limestone screenings, for example, which carry an initial moisture content of 5% to 8%. The Kiln Mill grinds them to a fineness of better than 95% passing 200-mesh, and *at the same time* reduces the moisture to less than ¼ of one per cent.

In handling gypsum, the Kiln Mill takes the raw material, containing as high as 5% surface moisture, and thoroughly dries it while pulverizing. The machine delivers the fine dry powder to the kettle bins at a temperature of about 180 degrees Fahrenheit. This method insures a free-flowing product, shortens the time of kettles by one-third, and makes an important saving in fuel.

On practically all non-metallic minerals, maximum output in pulverizing can be obtained only when the products are absolutely dry. By introducing controlled heat into the grinding chamber, the Kiln Mill increases the tonnage per hour and decreases the cost per ton. It enables you, at one stroke, to eliminate an expensive pre-drying operation.

If you are interested in this profitable method of pulverizing, write for the new 1932 Kiln Mill Bulletin—copies now available.

Raymond Kiln Mill
—dries as it grinds
Waste heat, such as radiated from kilns, may be utilized for the drying action; or furnace units with gas, oil, or coke fuel may be employed.



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Power wasted by metallic friction is more than a waste of power-dollars. *It actually works against* you.

Wasted power helps friction, that destructive force, in damaging machinery and in piling up extra production costs—for repairs, maintenance and lubricants.

This is one important reason why inadequate lubricants are extravagance, not economy. Correct Lubrication pays for itself in actual savings on power costs—and usually pays *extra* dividends in lower production costs.

In every type of world industry, Gargoyle Lubricants and Vacuum engineering service have established records for eliminating power waste and keeping production costs at a minimum. The Vacuum representative will be glad to show you operating cost records on the kind of machinery *you* use—*before* and *after* using Gargoyle Lubricants.

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We will be glad to send one or all of the above technical treatises on lubrication, to any executive or engineer, if requested on your company letterhead.

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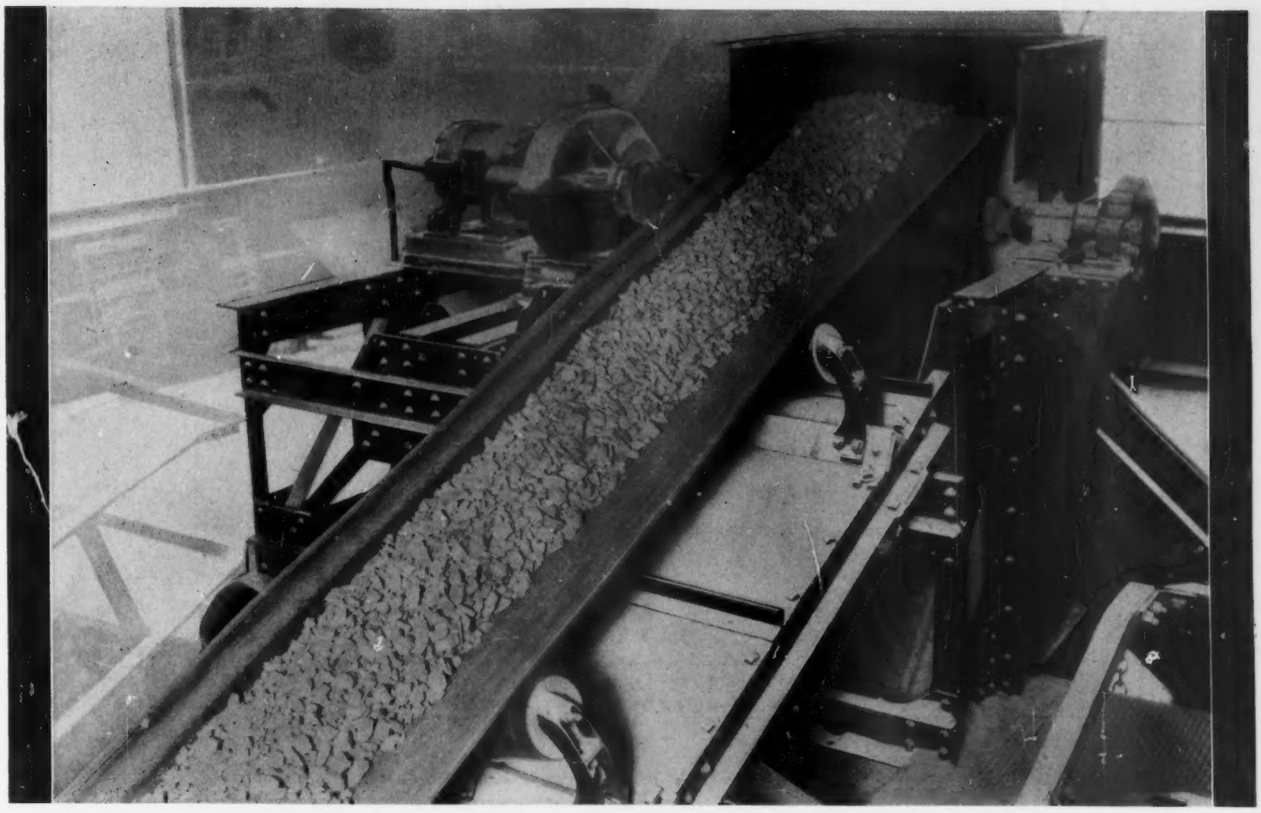

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Built to Meet Emergencies

Hundreds of users will testify that S-A belt conveyors are dependable. S-A engineers know the knocks and bumps conveyors are bound to get and build them to stand the racket.

Each detail is carefully planned and checked by men who have had years of field experience. Operating conditions are studied and every detail considered, not only for present conditions, but also for future emergencies.

Two of the eight S-A belt conveyors, used in a large crushing and screening plant, to carry stone from screen house to huge storage piles.

The S-A carriers upon which the heavily loaded belts roll are but one of the features of S-A conveyors. The rollers must be carefully finished and must turn freely to reduce belt wear and tension. The heavy ball or roller bearings must be easy to lubricate and must be thoroughly protected from dirt, grit and water. The carrier frames must be rigid and carefully designed to eliminate all chance for broken parts and injury to expensive belts.

No detail that will increase the life and service of S-A conveyors is overlooked.

Write us. An S-A engineer will be glad to call and suggest conveyor arrangements to save you time and money.

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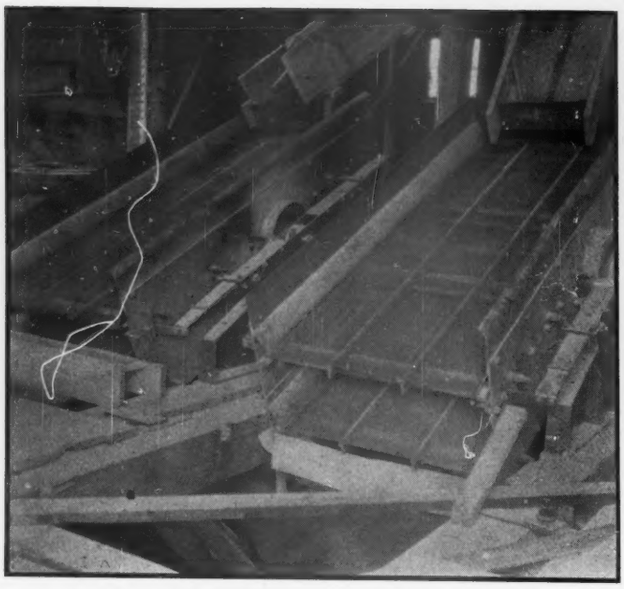
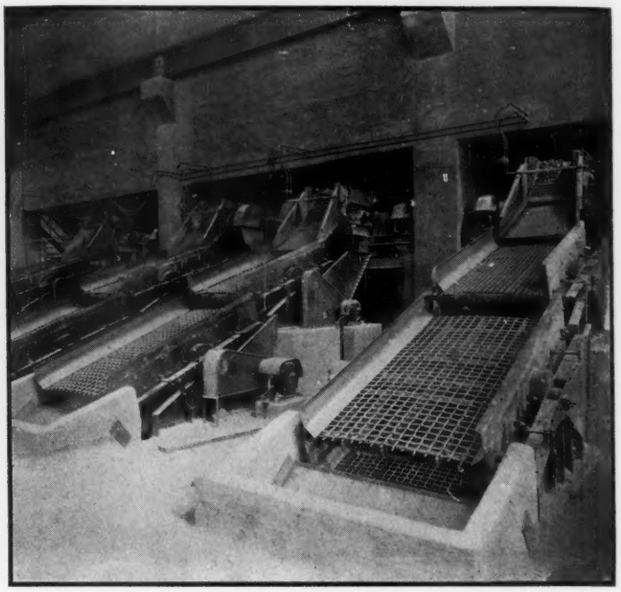
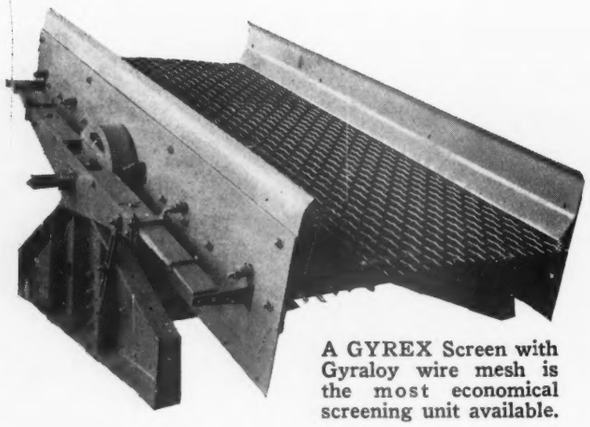




During 1931 The GYREX Went Over Big



A GYREX Screen with Gyraloy wire mesh is the most economical screening unit available.

SEVERAL hundred units were sold, with the orders coming from all parts of the country.

Several reasons account for this wide-spread preference for the GYREX, reasons both operating and maintenance, for example: widest range of speeds and stroke; a finely engineered and constructed vibrator; a most effective spring assembly; a sturdy, flat bottom, anvil-like base; a simple slope adjustment. Features such as these counted heavily in building up this preference for the GYREX.

If you knew more about the GYREX Screen and about those who are using it, you, too, would want this screen in your plant to reduce screening costs. Full details and references may be obtained from our nearest office or send for Bulletin No. 80.

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Robins Conveying Belt Co.
Sprout, Waldron & Co., Inc.

Conveyors and Elevators
Earle C Bacon, Inc.
Fuller Co.
Lewistown Fdy. & Mach. Co.
McLanahan & Stone Corp.
Robins Conveying Belt Co.
F. L. Smidth & Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Sprout, Waldron & Co., Inc.
Traylor Eng. & Mfg. Co.

Conveyors (Pneumatic)
Fuller Company

Conveyors (Screw)
Bethlehem Fdy. & Machine Co.
Sprout, Waldron & Co., Inc.

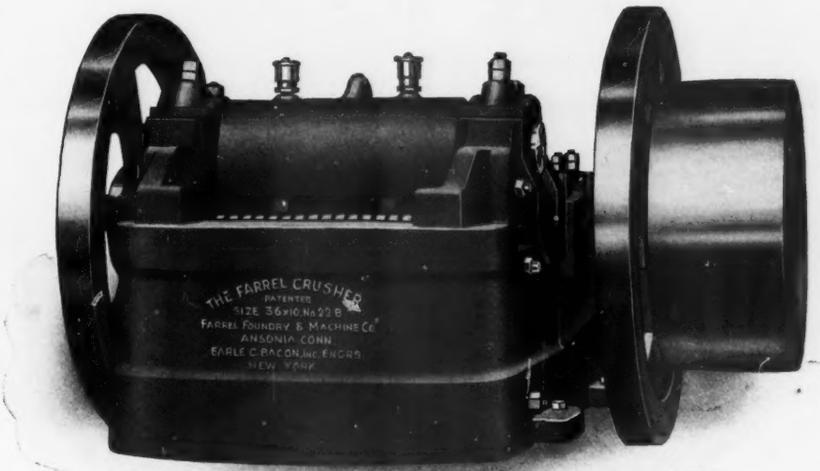
Conveyoweighs
Richardson Scale Co.

Coolers (See Kilns and Coolers, Rotary)

Correcting Basins
F. L. Smidth & Co.

Couplings (Hose, Pipe, etc.)
B. F. Goodrich Rubber Co.

• • • FARREL-BACON CRUSHERS • • •



A Farrel-Bacon Will Do It Better

SURVIVING the Age of Gadgets of the past decade is the old reliable Farrel-Bacon Jaw Crusher as a secondary and fine reduction unit.

It is the discerning operator who can eliminate the glowing possibilities of the untried and unproven. Farrel-Bacon secondary and reduction crushers have a background of forty years service in the field. They represent the first crusher built in America. Consistent with the times, they are modern and up to date, but along proven lines.

For size of receiving opening, ratio of reduction, economy of operation, quantity production of cubical product, the job can be done better with the Farrel-Bacon Crusher.

Farrel-Bacon furnishes complete equipment such as Screening plants, Elevators, Conveyor and crushing rolls, Drives, Gears, etc.

Write for the Farrel-Bacon illustrated book

A Few Sizes of Farrel-Bacon Secondary and Reduction Crushers and Their Approximate Capacities at Closed Setting of Jaws

No.	Size	Tons Per Hour				WEIGHT OF HEAVIEST PIECE	TOTAL WEIGHT
30½B	48″ x 12″	120 to 3″	100 to 2″	85 to 1½″		45,550 lbs.	73,200 lbs.
23B	36″ x 15″	60 to 2″	50 to 1½″	35 to 1″	30 to ¾″	34,000 “	58,000 “
21B	36″ x 6″	50 to 1½″	30 to 1″	25 to ¾″		20,900 “	42,000 “
10B	30″ x 13″	40 to 3″	30 to 2″	25 to 1½″	15 to ¾″	20,000 “	39,000 “
8B	20″ x 10″	20 to 2½″	15 to 2″	10 to 1″		11,000 “	21,000 “
7½″B	19″ x 14″	25 to 2½″	20 to 2″	15 to 1½″	10 to ¾″	16,000 “	28.000 “

EARLE C. BACON, Inc.

Engineers to the Crushed Stone Industry

26 Cortlandt St., New York, N. Y.

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 112

Cranes (Barge)
The Ohio Locomotive Crane Co.

Cranes (Clamshell)
Bucyrus-Erie Co.

Cranes (Crawler and Locomotive)
Bucyrus-Erie Co.
Ohio Locomotive Crane Co.

Cranes (Locomotive)
(See Cranes, Crawlers and Locomotive)

Crusher Parts
Earle C. Bacon, Inc.
Taylor-Wharton Iron & Steel Co. (Manganese)

Crushers (Jaw and Gyratory)
Allis-Chalmers Mfg. Co.
Earle C. Bacon, Inc. (Jaw)
C. G. Buchanan Co., Inc.
Lewistown Fdry. & Mach. Co.
Nordberg Mfg. Co.
Polysius Corp.
Smith Engineering Works
Traylor Eng. & Mfg. Co.

Crushers (Rotary)
J. B. Ehrsam & Sons Mfg. Co.

Crushers (Single Roll)
McLanahan & Stone Corp.

Crushing Rolls
Allis-Chalmers Mfg. Co.
C. G. Buchanan Co., Inc.
Fuller Lehigh Company
Traylor Eng. & Mfg. Co.

Cutter (Traveling Chain Ladder Type Suction Nozzle)
Eagle Iron Works

Dewatering Machines
The Dorr Company

Diaphragms (Pump)
B. F. Goodrich Rubber Co.

Dippers and Teeth (Steam Shovel)
Bucyrus-Erie Co.

Dipper Teeth
The Frog, Switch & Mfg. Co.

Dipper Teeth (Manganese)
Taylor-Wharton Iron & Steel Co.

Ditchers
Bucyrus-Erie Co.

Draglines
Bucyrus-Erie Co.

Dragline Cableway Excavators
Bucyrus-Erie Co.

Dragline Excavators
Bucyrus-Erie Co.

Dragline Excavators (Walking)
Bucyrus-Monighan Co.

Drag Shovels
Bucyrus-Erie Co.

Dredge Chain (See Chain)

Dredge Pipe (See Pipe)

Dredges
Bucyrus-Erie Co.
Morris Machine Works
F. M. Welch Engineering Service

Dredging Sleeves
B. F. Goodrich Rubber Co.

Drives (See Gears, Chain Drives, etc.)

Drives (Short Center)
Allis-Chalmers Mfg. Co.
Sprout, Waldron & Co., Inc.

Dryers
Allis-Chalmers Mfg. Co.
Combustion Eng. Corp.
Fuller Lehigh Company
Lewistown Fdry. & Mach. Co.
McGann Mfg. Co., Inc.
Ruggles-Coles Div. of Hardinge Co., Inc.
Traylor Eng. & Mfg. Co.

Dust Arresters
Pangborn Corporation

Dust Collecting Systems
Allis-Chalmers Mfg. Co.
Pangborn Corporation

Dust Control
Blaw-Knox Co.

Dust Conveying Systems
Fuller Co.

Electric Mine Hoists
Nordberg Mfg. Co.

Electric Power Equipment
Allis-Chalmers Mfg. Co.
General Electric Co.

Elevator Belting (See Belting)

Elevator Buckets (See Buckets—Elevator)

Elevators (See Conveyors and Elevators)

Engineers
The Dorr Company
Robins Conveying Belt Co.
F. L. Smidth & Co.
F. M Welch Engineering Service

Engines (Diesel)
Nordberg Mfg. Co.

Engines (Steam)
Morris Machine Works

Excavating Machinery (See Shovels, Cranes, Buckets, etc.)

Fans (Electric)
General Electric Co.

Feeders
Fuller Co. (Cement and Pulverized Material)
Fuller Lehigh Co. (Pulverized Coal)
Robins Conveying Belt Co.
Smith Engineering Works (Plate)
Sprout, Waldron & Co., Inc. (Pulverized Coal)

Feeders (Weighing)
Hardinge Co., Inc.
Schaffer Poidometer Company

Fire Brick
Corhart Refractories Co.

Forgings
Taylor-Wharton Iron & Steel Co.

Frogs and Switches
Easton Car & Construction Co
Taylor-Wharton Iron & Steel Co.

Furnaces
Combustion Eng. Corp.

Fuses (Detonating and Safety)
Ensign-Bickford Co.

Fuses (Electrical)
General Electric Co.

Gaskets
B. F. Goodrich Rubber Co.

Gates (Bin) (See Bin Gates)

Gears (Spur, Helical and Worm)
Philadelphia Gear Works
Taylor-Wharton Iron & Steel Co.

Gears and Pinions
Bethlehem Fdy. & Machine Co.
General Electric Co.
Taylor-Wharton Iron & Steel Co.

Generators (See Motors and Generators)

Grab Bucket Cranes (See Cranes)

Grab Bucket Hoists (Monorail) (See Cranes)

Grating (Steel)
Blaw-Knox Co.

Grinding Balls
Fuller Lehigh Co.

Grizzlies
Eagle Iron Works
Lewistown Fdy. & Mach. Co.
Robins Conveying Belt Co.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.

Grizzly Feeders
Traylor Eng. & Mfg. Co.

Guns (Hydraulic)
Taylor Forge & Pipe Wks.

Gypsum Plaster Plants
J. B. Ehrsam & Sons Mfg. Co.

Gyrating Screens (See Screens)

Hammer Mills (See Crushers)

High-Alumina Brick (See Brick, High-Alumina)

Hoists (Skip) (See Skip Hoists and Skips)

Hose (Water, Steam, Air Drill, Sand Suction and Discharge)
B. F. Goodrich Rubber Co.

ANNOUNCING . . . . .

The Sixteenth Annual Convention

National Sand and Gravel Association

WILLIAM PENN HOTEL— PITTSBURGH, PA.

January 27, 28, 29, 1932

A cordial invitation to attend this Convention is extended to every established sand and gravel producer in the United States and Canada.

Railroads have granted a reduction in fares, amounting to one-quarter of the regular round-trip rate, to those who will go to Pittsburgh for this Convention.

FOR FULL INFORMATION WRITE TO

NATIONAL SAND AND GRAVEL ASSOCIATION

545 MUNSEY BUILDING WASHINGTON, D. C.

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 112

Hydrators (Lime)
Blaw-Knox Co.
McGann Mfg. Co., Inc.

Hydraulic Guns (See Guns, Hydraulic)

Insulation (Electric)
General Electric Co.

Kiln Liners
Corhart Refractories Co.

Kilns and Coolers (Rotary)
Allis-Chalmers Mfg. Co.
Blaw-Knox Co.
Hardinge Co., Inc.
McGann Mfg. Co., Inc.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.

Kilns (Lime)
Blaw-Knox Co.

Kilns (Shaft)
Hardinge Co., Inc.
McGann Mfg. Co., Inc.

Kommuters (See Mills)

Lighters—Hot Wire (For Safety Fuse)
Ensign-Bickford Co.

Lime Handling Equipment
Fuller Co.
Hardinge Co., Inc.
Raymond Bros. Impact Pulv. Co.
Sprout, Waldron & Co., Inc.

Lime and Hydrating Plants
Blaw-Knox Co.
McGann Mfg. Co., Inc.

Linings (See Mill Liners and Linings)

Linings (Hot Zone)
Corhart Refractories Co.

Linings (Iron for Ball and Tube Mills) (See Mill Liners)

Linings (Kiln)
Corhart Refractories Co.

Linings (Rubber for Ball and Tube Mills)
B. F. Goodrich Rubber Co.

Loaders and Unloaders
Bucyrus-Erie Co.
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

Locomotive Cranes (See Cranes)

Locomotives (Diesel)
The Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Diesel-Electric)
The Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Gas Electric)
The Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Geared)
Lima Locomotive Works, Inc.

Locomotives (Oil-Electric)
The Fate-Root-Heath Co.
Plymouth Locomotive Works

Locomotives (Steam, Gas and Electric)
Fate-Root-Heath Co. (Gas)
General Electric Co.
Lima Locomotive Works, Inc.
Plymouth Locomotive Works (Gas)

Locomotives (Storage Battery)
General Electric Co.

Log Washer
Smith Engineering Works

Lubricants
Vacuum Oil Co.

Machinery Guards
Harrington & King Perforating Co.

Magnetic Pulleys
C. G. Buchanan Co., Inc.

Magnets
General Electric Co.

Manganese Steel Castings
The Frog, Switch & Mfg. Co.
Taylor-Wharton Iron & Steel Co.

Manganese Steel Parts
Taylor-Wharton Iron & Steel Co.

Manganese Welding Rod
Taylor-Wharton Iron & Steel Co.

Mechanical Rubber Goods
B. F. Goodrich Rubber Co.

Metal (Alloys—See Alloys, Babbitt Metal, Manganese Steel, Steel, etc.)

Mills (Grinding) (Ball, Tube, etc.) (See also Crushers, Hammer)
Allis-Chalmers Mfg. Co.
Bethlehem Fdy. & Machine Co.
Bradley Pulverizer Co.
Hardinge Co., Inc.
Lewistown Fdy. & Mach. Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.
Traylor Eng. & Mfg. Co.

Mill Liners and Linings (Iron for Ball and Tube Mills)
Bethlehem Foundry & Machine Co.
Fuller Lehigh Company
Hardinge Co., Inc.
F. L. Smidth & Co.

Mining Engineers (See Engineers)

Motors and Generators (Electric)
Allis-Chalmers Mfg. Co.
General Electric Co.

Nozzles (Gravel Washing)
Binks Mfg. Co.

Oils (Lubricating)
Vacuum Oil Co.

Packings (Pump, Valve, etc.)
B. F. Goodrich Rubber Co.

Perforated Metal
Chicago Perforating Co.
Cross Engineering Co.
Harrington & King Perforating Co.
Taylor-Wharton Iron & Steel Co., (Managnese)

Pipe (Dredge, Etc.)
Taylor Forge & Pipe Works

Plaster Board & Wallboard Equipment
J. B. Ehrsam & Sons Mfg. Co.

Poidometers
Schaffer Poidometer Co.

Portable Conveyors
Fuller Co.
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.

Portable Crushing and Screening Unit
Smith Engineering Works

Pulleys (Magnetic) (See Magnetic Pulleys)

Pulverizers (See also Crushers, Mills, etc.)
Allis-Chalmers Mfg. Co.
Bradley Pulverizer Co.
Fuller Lehigh Co.
Hardinge Co., Inc.
Kent Mill Co.
Lewistown Fdy. & Mach. Co.
Raymond Bros. Impact Pulv. Co.
F. L. Smidth & Co.

Pumps (Air Lift)
Fuller Co.

Pumps (Cement)
Fuller Company

Pumps (Cement Slurry)
The Dorr Company
Morris Machine Works.
F. L. Smidth & Co.
A. R. Wilfley & Sons

Pumps (Centrifugal)
Allen Cone & Machy. Corp.
Allis-Chalmers Mfg. Co.
De Laval Steam Turbine Co.
Hetherington & Berner, Inc.
Morris Machine Works
A. R. Wilfley & Sons

Pumps (Dredging)
Bucyrus-Erie Company

Pumps (Pulverized Coal)
Fuller Lehigh Co.

Pumps (Sand and Gravel)
Allis-Chalmers Mfg. Co.
Hetherington & Berner, Inc.
Morris Machine Works
A. R. Wilfley & Sons

Rails
Easton Car & Construction Co.

Railway Equipment
General Electric Co.

Railways (Electric)
General Electric Co.

Refractories
Corhart Refractories Co.

Rod Mills
Hardinge Co., Inc.
Traylor Eng. & Mfg. Co.

Rope (Wire) (See Wire Rope)

Rubber Covered Screens
B. F. Goodrich Rubber Co.

Sand and Gravel Handling Equipment
Sprout, Waldron & Co., Inc.

The Fifteenth Annual Convention

OF THE

National Crushed Stone Association

WILL BE HELD AT THE

William Penn Hotel
Pittsburgh
Pennsylvania
January 19, 20
21, 22, 1932

Pittsburgh in 1932

¶ In conjunction therewith the Manufacturers' Division will hold its annual Exposition of Quarry Equipment and Machinery which has come to be recognized as one of the outstanding events of the meeting.

¶ Make your plans now to attend this annual foregathering of the crushed stone industry.

¶ All crushed stone producers of the United States and Canada, regardless of whether or not they are members of this Association, are most cordially invited to be present at Pittsburgh and share with us the many pleasures and benefits of the Convention.

For Further Information Address

THE NATIONAL CRUSHED STONE ASSOCIATION
1735 Fourteenth Street, N.W.
WASHINGTON, D. C.

Classified Directory of Advertisers in this Issue of ROCK PRODUCTS

For alphabetical index, see page 112

Sand Drag
Smith Engineering Works

Sand Settling Tanks
Allen Cone & Machy. Corp.
Smith Engineering Works
Stephens-Adamson Mfg. Co.
F. M. Welch Engineering Service

Scales (Automatic Proportioning)
Richardson Scale Co.

Scales (Cement)
Richardson Scale Co.

Screens
Allis-Chalmers Mfg. Co.
Earle C. Bacon, Inc.
Chicago Perforating Co.
Cross Engineering Co.
Eagle Iron Works
Hardinge Co., Inc.
Harrington & King Perforating Co.
Kent Mill Co.
Lewistown Fdy. & Machine Co.
Robins Conveying Belt Co.
Simplicity Eng. Co.
Smith Engineering Works
Sprout, Waldron & Co., Inc.
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
Universal Vibrating Screen Co.
F. M. Welch Engineering Service

Screens (Scalping) (Hercules and Standard)
McLanahan & Stone Corp.
Smith Engineering Works

Screens (Vibrating)
Allen Cone & Machy. Corp.
Deister Machine Co.
Robins Conveying Belt Co.
Simplicity Eng. Co.
Smith Engineering Works
Sprout, Waldron & Co., Inc.
Universal Vib. Screen Co.

Screens (Washing) (Hercules, Ajax and Standard)
Smith Engineering Works

Screw Rewasher (Single and Twin)
Smith Engineering Works

Scrubbers
F. M. Welch Engineering Service

Seal Rings (Kilns, Coolers and Dryers)
Bethlehem Fdy. & Machine Co.

Separators (Air)
(See Air Separators)

Separators (Magnetic)
C. G. Buchanan Co., Inc.

Separators (Slurry)
F. L. Smidth & Co.

Shale Removers
Eagle Iron Works

Shovel Repair Parts (Manganese)
Taylor-Wharton Iron & Steel Co.

Shovels (Power) (Steam, Gas, Electric, Diesel, Oil)
Bucyrus-Erie Co.

Silos
F. L. Smidth & Co.

Skip Hoists and Skips
Robins Conveying Belt Co.
F. M. Welch Engineering Service

Slings (Wire Rope)
American Steel & Wire Co.
A. Leschen & Sons Rope Co.

Slugs (Wire Rope)
American Steel & Wire Co.

Speed Reducers
De Laval Steam Turbine Co.
Philadelphia Gear Works

Spouts, Chutes (See Chutes and Chute Liners)

Spray Nozzles
Binks Mfg. Co.

Sprockets and Chain
Taylor-Wharton Iron & Steel Co.

Stackers
F. M. Welch Engineering Service

Steel (Bars, Shapes, Plates, etc.)
Joseph T. Ryerson & Son, Inc.

"Stellited" (Die Rings, etc.)
Bethlehem Fdy. & Machine Co.

Stokers
Combustion Eng. Corp.

Storage Equipment
Stephens-Adamson Mfg. Co.

Tanks
Combustion Eng. Corp.
The Dorr Company

Texrope Belts (for Texrope Drives)
B. F. Goodrich Rubber Co.

Thickeners
The Dorr Company
Hardinge Co., Inc.

Tires (for Commercial and Passenger Cars)
B. F. Goodrich Rubber Co.

Track Equipment
Easton Car & Construction Co.
Taylor-Wharton Iron & Steel Co.

Track Shifters
Nordberg Mfg. Co.

Tractors
Linn Mfg. Corp. Div. of La France Republic Corp.

Tractor Trucks
Linn Mfg. Corp. Div. of La France Republic Corp.

Trailer Cranes (See Cranes)

Tramways (Aerial Wire Rope)
American Steel & Wire Co.
Interstate Equipment Corp.
A. Leschen & Sons Rope Co.

Transmission Machinery
Allis-Chalmers Mfg. Co.
Sprout, Waldron & Co., Inc.
Stephens-Adamson Mfg. Co.

Trippers
Robins Conveying Belt Co.

Truck Cranes (See Cranes)

Tube Mills (See Mills, Ball, Tube, etc.)

Tube Mill Liners (See Mill Liners)

Tubing (Blasting)
B. F. Goodrich Rubber Co.

Turntables
Easton Car & Construction Co.

Underground Shovels
Nordberg Mfg. Co.

Valves (Pump)
B. F. Goodrich Rubber Co.

Variable Speed Transmissions
Stephens-Adamson Mfg. Co.

Vibrating Screens (See Screens, Vibrating)

Washers (Sand, Gravel and Stone)
Allen Cone & Machy. Corp.
Allis-Chalmers Mfg. Co.
Deister Machine Co.
The Dorr Company
Eagle Iron Works
Lewistown Fdy. & Machine Co.
Sprout, Waldron & Co., Inc.
Stephens-Adamson Mfg. Co.
Traylor Eng. & Mfg. Co.
F. M. Welch Engineering Service

Waste Heat Boilers
Combustion Eng. Corp.

Water Softening Systems
Deister Machine Co.

Weighing Equipment
Merrick Scale Mfg. Co. (Automatic Proportioning)
Richardson Scale Co.
Schaffer Poidometer Co.

Welding and Cutting Apparatus
General Electric Co.

Welding Rod
Taylor-Wharton Iron & Steel Co., (Manganese)

Welding Wire
American Steel & Wire Co.

Wheels (Car)
Eagle Iron Works
Easton Car & Construction Co.

Winches and Capstans
Stephens-Adamson Mfg. Co.

Wire Cloth (Manganese)
Taylor-Wharon Iron & Steel Co.

Wire Rope
American Steel & Wire Co.
Hazard Wire Rope Co.
A. Leschen & Sons Rope Co.

Wire Rope Fittings
American Steel & Wire Co.
Hazard Wire Rope Co.
A. Leschen & Sons Rope Co.

Wire Rope Slings (See Slings, Wire Rope)

Worm Gears (See Gears)

LEWISTOWN FOUNDRY PRODUCTS

12x20-inch Jaw Crusher

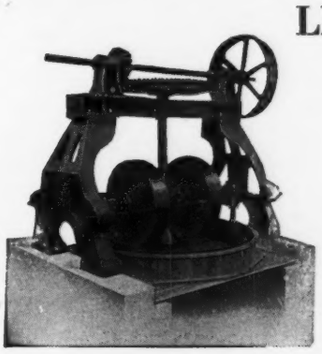
FOR many years the line of Lewistown Crushing, Grinding, Screening, Washing, Drying and Elevating equipment has proven its absolute dependability under all conditions of service.

A very extensive experience enters into its design. Rugged construction assures low maintenance cost.

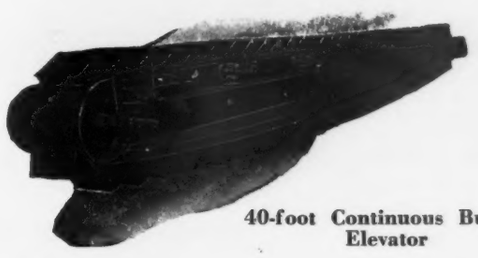
Lewistown equipment is reasonably priced and represents a profitable investment.

Write for Specifications and Prices

LEWISTOWN FOUNDRY & MACHINE CO.
Lewistown, Pa.

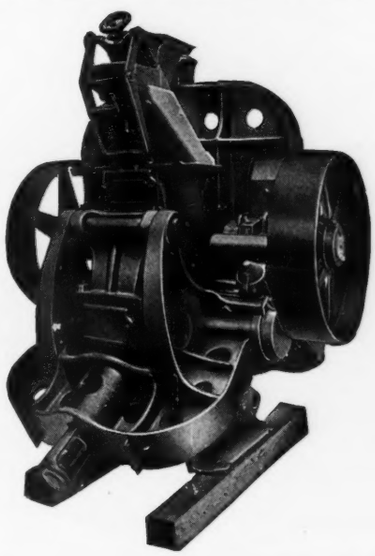


9-foot Dry Pan



40-foot Continuous Bucket Elevator

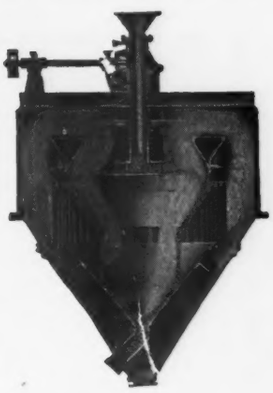
Maxecon Mill



for economical pulverizing

American Filter Air Separator

for fine separating

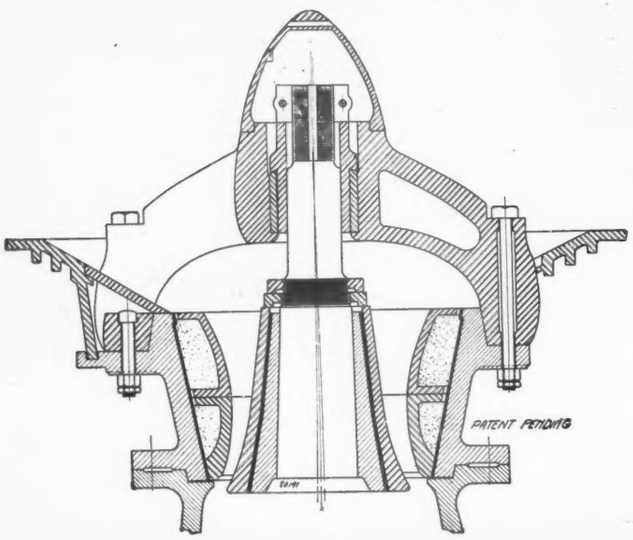


Perfectecon Screen

for coarse screening

KENT MILL COMPANY
10 Rapelyea Street Brooklyn, N. Y.

BELL HEADS MUST BE USED WITH CURVED CONCAVES!



CAPACITY DOUBLED!

WITH

TRAYLOR

ORIGINAL NON-CHOKABLE HEAD and CONCAVES

The Capacity of Your Old Gates, Austin, McCully or Other Gyratory Type Crusher Can Be Increased 100% at Closer Settings; Choking Is Eliminated; Setting May Be Half the Present Minimum; Crushing Surfaces of Head and Concaves Wear Uniformly; Product Is More Uniform with Less Percentage of Wasteful Fines.

See Our Bulletin for the Whole Story

TRAYLOR ENGINEERING AND MFG. CO.
Allentown, Penna.

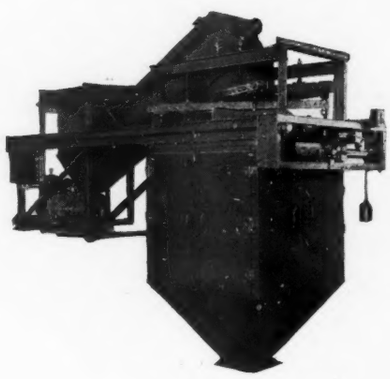
NEW YORK 2513 Empire State Bldg. CHICAGO 1414 Fisher Bldg. LOS ANGELES 908-909 Chester Williams Bldg.
SALT LAKE CITY 101 W. 2nd South St. SEATTLE 815 Alaska Bldg.
TIMMINS, ONTARIO, CANADA, Moore Block
Export Department, 104 Pearl St., New York City—Cable Address: "Forsaltra"
Foreign Sales Agencies: London, Rangoon, Johannesburg, Lima, Rio de Janeiro, Sao Paulo, Buenos Aires, Santiago, Valparaiso, Antofagasta, Iquique, Oruro
European Works—Usines Carels Freres, Ghent, Belgium

CEMENT MILLS

More and more bulk cement is being used today and more is contemplated for 1932.

Are you equipped to weigh out bulk cement quickly and without delay?

The RICHARDSON Automatic Bulk Cement Scale



has been installed and proven by Cement Mills.

Two Richardson Automatic Bulk Cement Scales are operating under immediate supervision of the Department of Weights and Measures, Bureau of Standards, Washington, D. C.

PREPARE NOW

for your bulk shipments and be ready for increased volume of bulk cement shipments in 1932.

Write for Bulletin No. 9630-G

RICHARDSON SCALE COMPANY
Clifton, N. J.

New York Minneapolis Chicago Omaha Los Angeles Boston Atlanta Philadelphia Wichita
Agents for Eastern Canada: Messrs. Peacock Brothers, Limited, Montreal

WE SPECIALIZE IN

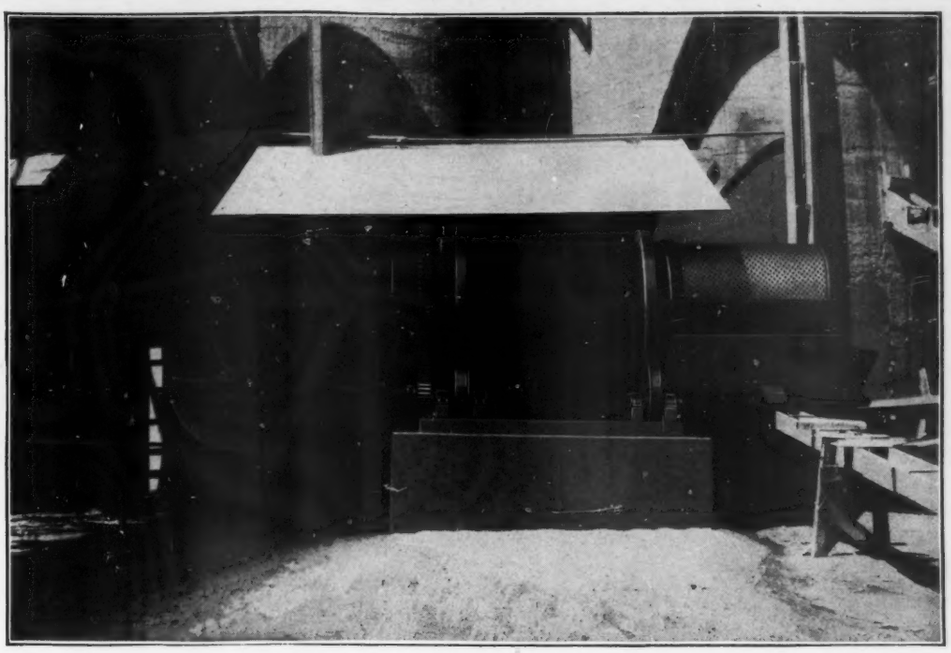
SCRUBBING PROBLEMS

OF ALL KINDS IN

CRUSHED STONE

OR

GRAVEL



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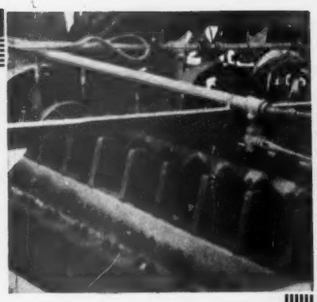

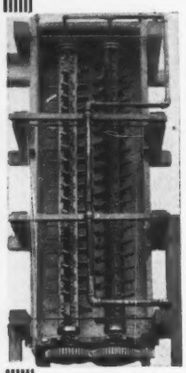

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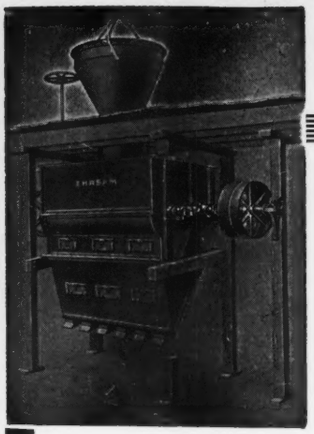

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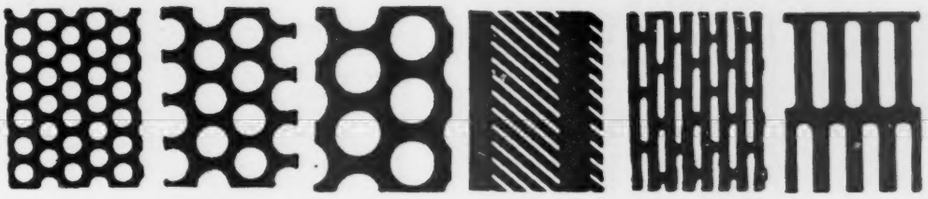

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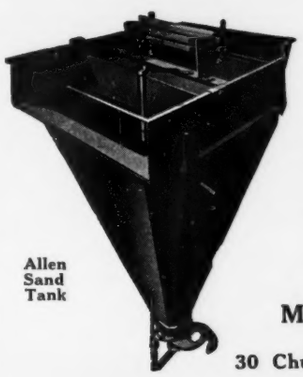

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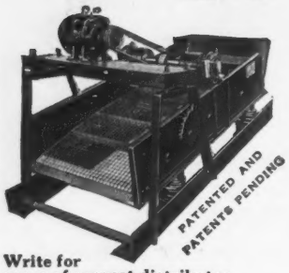

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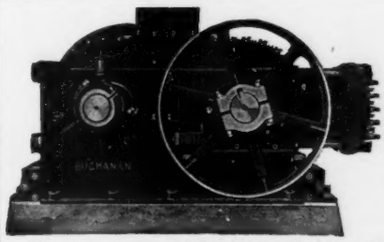

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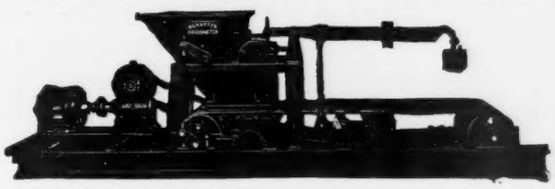

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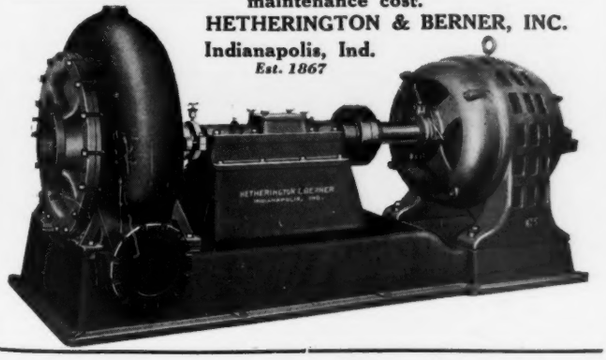

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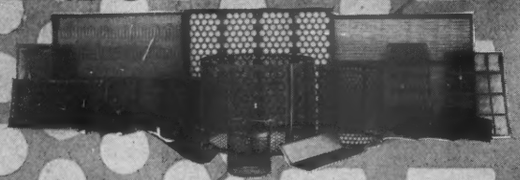

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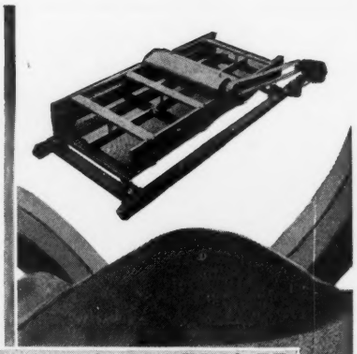

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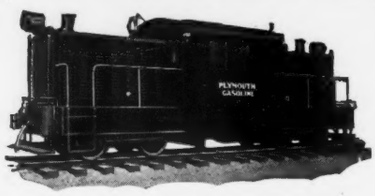

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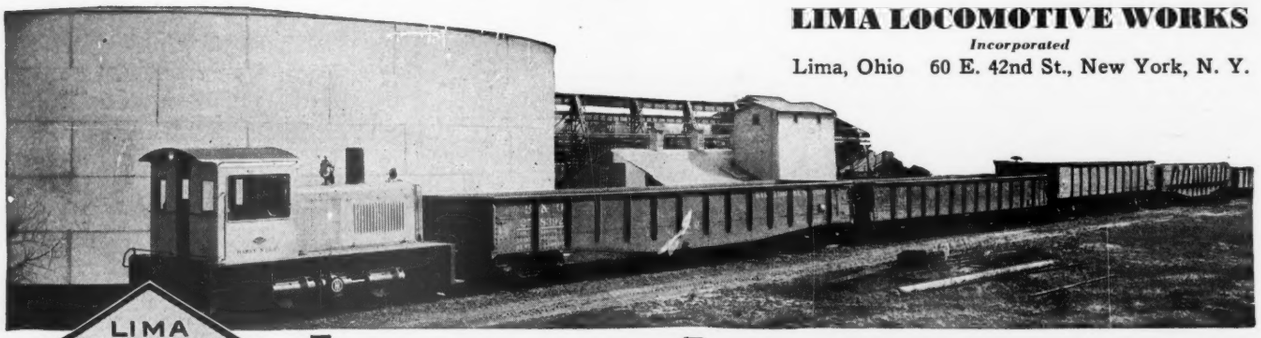

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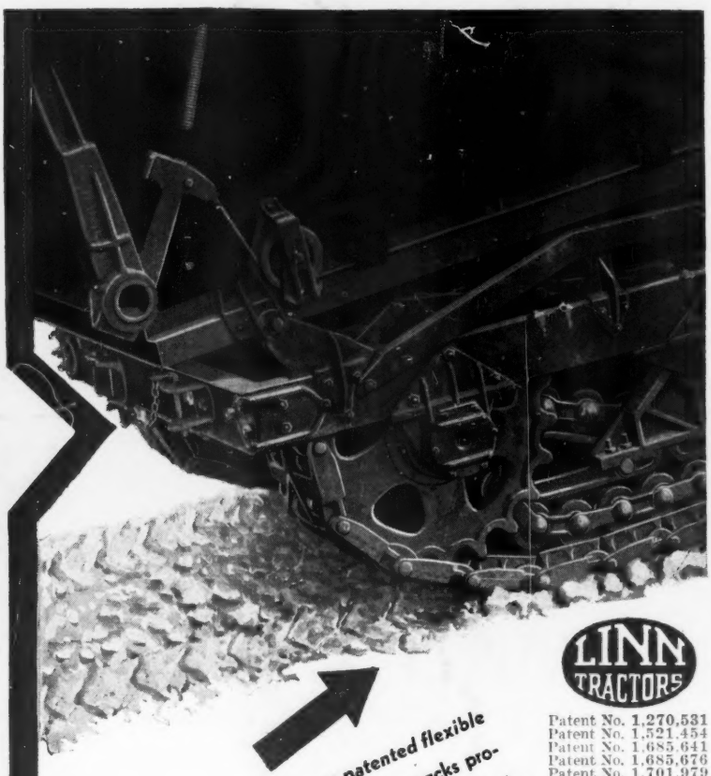

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